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U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF AGROSTOLOGY.

NOTES ON

GRASSES AND FORAGE PLANTS

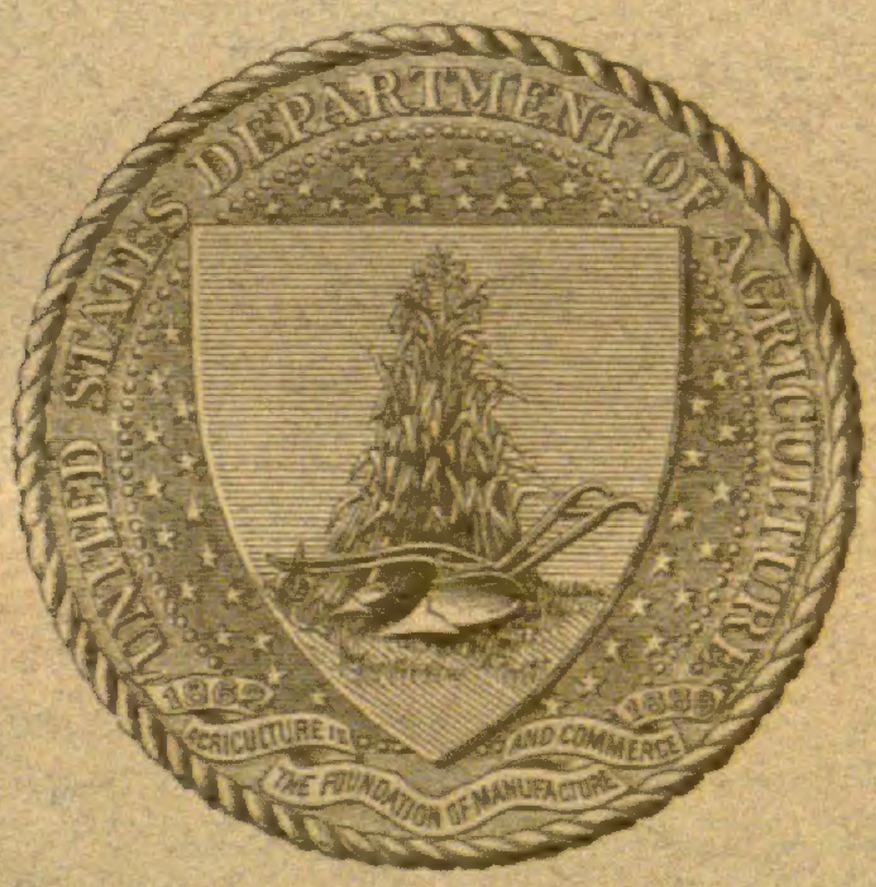
OF THE

SOUTHEASTERN STATES.

BY

THOMAS H. KEARNEY, Jr.,

ASSISTANT AGROSTOLOGIST.



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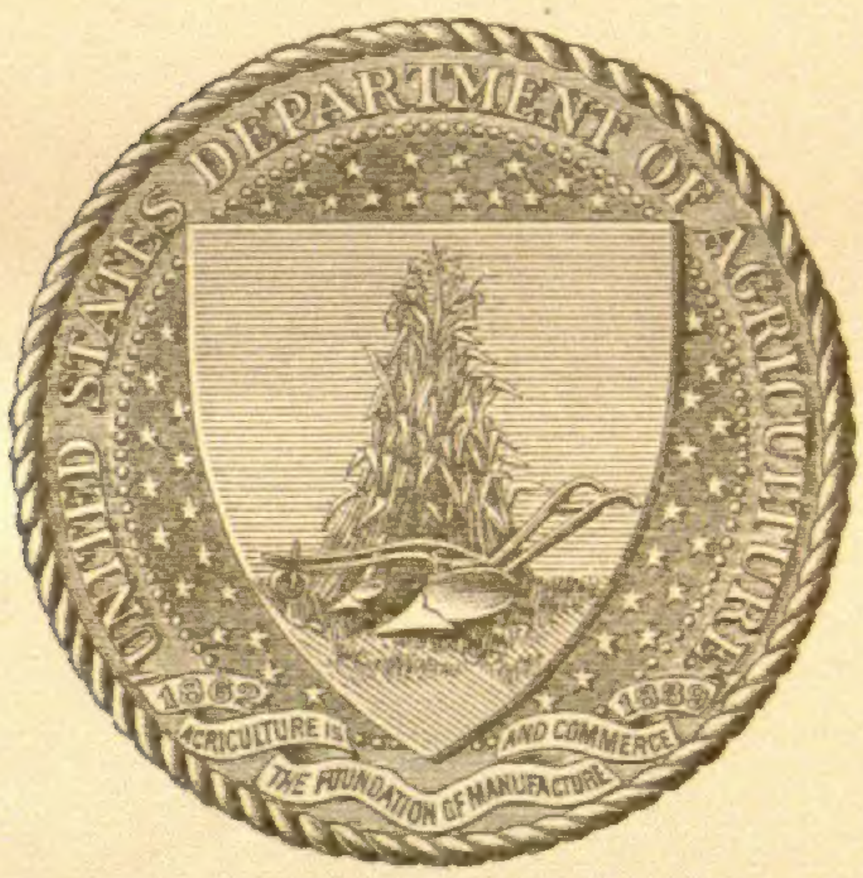

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LETTER OF TRANSMITTAL.

UNITED STATES DEPARTMENT OF AGRICULTURE,
DIVISION OF AGROSTOLOGY,
Washington, D. C., September 19, 1895.

SIR: I have the honor to transmit herewith for publication some notes on the grasses and forage plants of the Southeastern States, prepared by my assistant, Thomas H. Kearney, jr. These notes are based upon direct observations in the field, made in accordance with a commission from the Secretary of Agriculture under date of June 18, 1895. In accordance with his instructions Mr. Kearney visited Knoxville, Tenn.; Selma and Mobile, Ala.; Tallahassee, Apalachicola, Jacksonville, and St. Augustine, Fla.; Savannah and Augusta, Ga.; Aiken, S. C.; Wilmington, N. C., and Norfolk, Va. He was directed to note all the species of grasses at the several points visited, and to gather all facts obtainable relative to them which might be of scientific or economic interest.

Material assistance in accomplishing this work and much valuable information concerning the grasses and other forage plants of their respective localities was furnished by Dr. Charles Mohr, of Mobile, Ala.; Dr. A. W. Chapman, of Apalachicola, Fla.; Judge R. C. Long, of Tallahassee, Fla., and Capt. W. W. Woolsey, of Aiken, S. C.

The paper here presented is divided into two parts—the first, devoted to forage plants of actual or possible value, the several kinds being enumerated in alphabetical order for more ready reference; the second comprises a list of all the species of Gramineæ collected or seen, arranged according to their natural classification, with observations of purely botanical interest. This arrangement of the matter separates the economic from the scientific portions of the report, which will be appreciated alike by the farmer and the botanist.

Respectfully,

F. LAMSON-SCRIBNER,
Agrostologist.

Hon. J. STERLING MORTON,
Secretary of Agriculture.

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NOTES ON GRASSES AND FORAGE PLANTS COLLECTED OR OBSERVED IN THE SOUTHEASTERN STATES.

PART I.

ECONOMIC NOTES UPON THE GRASSES AND OTHER FORAGE PLANTS OF THE REGION TRAVERSED.

Very few plants are widely cultivated in the South for hay or pasturage, the farmer relying for the most part upon the wild grasses. These may be roughly divided into two classes—the first comprising introduced grasses, mostly annuals, which spring up on cultivated land after the regular crop has been removed; the second, native grasses, the majority perennials, which make the bulk of the pasturage. Of the first class by far the most important is crab grass (*Panicum sanguinale*), which forms a great part of the volunteer hay crop of the South Atlantic and Gulf States. With it are often associated crowfoot or barn grass (*Eleusine indica*), little crowfoot (*Dactyloctenium ægyptiacum*), pigeon grass (*Setaria glauca*), and, in the far South, spur grass (*Cenchrus echinatus*) and Mexican clover (*Richardsonia scabra*). Of the native, perennial grasses perhaps the most important belong to the genus *Paspalum*, Louisiana grass (*Paspalum platycaule*) being the most common and best known. *Panicum serotinum* is also a valuable pasture grass over extensive areas. The broom sedges (Andropogon species), early in the season, make the bulk of the grazing on thin dry soils. Three other widely known forage plants, belonging to neither of these classes, must be mentioned. Johnson grass, dreaded as a weed yet esteemed as a forage plant, is an introduced perennial grass, highly valued for hay. Japan clover (*Lespedeza striata*) is perhaps the most valuable pasture maker, for the largest area, in the Southern States, while both for hay and for grazing "Bermuda" is king among grasses throughout the South.

ALPHABETICAL LIST OF THE GRASSES AND OTHER PLANTS OF THE SECTIONS VISITED WHICH ARE OR MAY BE OF IMPORTANCE AS FORAGE.

[With economic notes.]

AGROSTIS ALBA VULGARIS. (*See* Redtop.)

AGROSTIS PERENNANS.—In northern Alabama this grass remains green nearly all winter in damp, sheltered ground, and affords good pasturage.

ALFALFA.—Alfalfa is cultivated with great success near Augusta, Ga.

ANDROPOGON.—Several species of Andropogon, or broom sedge, of which *A. Virginicus* is the most common, are esteemed for pasturage in the South, as they flourish in very poor soils. In spring, while tender and juicy, they afford a fair amount of nutritious grazing; but as they mature they become dry and hard. At Tallahassee, Fla., they are considered by some as almost, if not quite, the most valuable pasture grasses of Leon County.

ANTHÆNANTIA VILLOSA.—This grass is frequent in dry, sterile pine barrens around Jacksonville, Fla., but never grows in great quantity. Otherwise it might be of some value, as the tufts of rather broad, tender root leaves should afford better grazing than most grasses of the pine barrens.

FIG. 1.—Broom sedge (*Andropogon virginicus*).

ARISTIDA STRICTA, the "wire grass" which covers large tracts of the pine barrens in the South Atlantic and Gulf States, is said to constitute a large part of the pasturage of the "barrens." It must be eaten when very young, for in July, though still immature, it was quite dry and hard, with rigid, wiry leaves. I have never seen the tufts cropped where cattle were grazing.

BARN GRASS. (*See Eleusine indica.*)

BARNYARD GRASS. (*See Panicum crus-galli.*)

BEGGAR WEED. (*See Desmodium tortuosum.*)

BERMUDA GRASS (*Cynodon dactylon*).—Perhaps no one plant represents more of value to the South than does "Bermuda;" certainly no other forage plant is more precious to that section. Whether for hay or for pasturage, it is everywhere placed first, and is considered the most nutritious grass that can be successfully grown in the Southern States. While it requires a fertile soil for its best development, it will grow on the thinnest soil, being a common plant of

seabeaches. In such situations the plants are very small, the erect, flowering stems being quite short, and long, sterile shoots (sometimes 6 feet long), rooting at every joint, are produced. In better land—a light, loamy soil seems to suit it best—the tendency to send out long, creeping shoots is checked, the upward growth is much greater, and the amount of leafage increases correspondingly, the whole plant becoming more tender and succulent Besides its great value as a forage plant, Bermuda is one of the most effective of soil holders. When growing on sandy river banks and ocean beaches it is, apparently, the most valuable sand-binding grass of the Southern States. It is sometimes planted by road-

FIG. 2.—Bermuda grass (*Cynodon dactylon*).

sides and upon embankments for this purpose, and is a favorite lawn grass in most towns and cities, forming a close, fine turf, and remaining green in the driest and most sun-exposed stations.

BIG CROWFOOT. (*See Eleusine indica.*)

BROMUS UNIOLOIDES. (*See* Rescue grass.)

BROOM SEDGE. (*See Andropogon.*)

CENCHRUS ECHINATUS.—This grass, known as "spur grass" in Florida, is a common weed of cornfields and of cultivated land generally in that State and elsewhere in the far South. When young, before the bur-like coverings of the flowers are developed, it is said to make excellent hay, being tender and nutritious, and pro-

ducing a considerable bulk of forage. But the burs, when mature, make the plant a troublesome weed, though not so formidable as the related sand spur (*C. tribuloides*). Judge R. C. Long, at Tallahassee, places this fourth among the spontaneous hay-making grasses of Leon County, Fla.

COWPEAS.—This is the most widely cultivated, in its several varieties, of leguminous plants in the South and highly valued, not only for its excellent forage qualities, but also as a restorer of exhausted soils As a crop for rotation with corn or other cereals, it is apparently unsurpassed. It is grown almost everywhere in the South Atlantic and Gulf States.

CRAB GRASS (*Panicum sanguinale*).—Crab grass is generally considered the best hay grass of the Southern States. It is never cultivated in the ordinary sense, but comes up spontaneously on arable land after the cultivated crop is taken off.

FIG. 3.—Crowfoot (*Eleusine indica*).

Sometimes the ground is lightly rolled, but that is the only preparation made for it. After a crop of corn or cotton, one, or sometimes two, good catches of crab hay are made on the land. On account of its rapid growth crab grass is peculiarly adapted for its functions as an after crop. In good soil, when favored by sufficient rain, it attains considerable size. At Mobile it was seen nearly 4 feet high. It is a tender grass and makes a sweet hay, but is slow to give up its moisture, and therefore rather difficult to cure. When allowed to get the better of the cultivator, it becomes a troublesome weed, but with ordinary care is easily subdued. With it are usually associated, in cultivated land, crowfoot (*Eleusine indica*), little crowfoot (*Dactyloctenium ægyptiacum*), and sometimes Mexican clover (*Richardsonia scabra*) and spur grass (*Cenchrus echinatus*), also sprouting crab grass (*Panicum proliferum*). At Aiken I saw a large lawn, quite a good-looking one, composed almost exclusively of this grass.

CRIMSON CLOVER.—In east Tennessee this clover, if cut young, when the heads are just beginning to flower, yields a hay of excellent quality I was told at Tallahassee that this is the only clover which will stand the hot, dry summers there.

CROWFOOT. (*See Eleusine* and *Dactyloctenium.*)

CYNODON DACTYLON. (*See* Bermuda grass.)

CYPERUS ROTUNDUS. (*See* Nut grass.)

DACTYLOCTENIUM ÆGYPTIACUM, generally known as "little crowfoot," is held in considerable esteem as a hay grass in most parts of the South. Like crab grass, it appears spontaneously in cultivated land, and forms a more or less important element of the crop of grass which springs up after the corn or cotton has been taken off. It is usually considerably smaller than the big crowfoot (*Eleusine indica*), which it much resembles; but sometimes attains a very fair size. At Tallahassee it was observed 2½ to 3 feet in height.

FIG. 4.—Little Crowfoot (*Dactyloctenium ægyptiacum*).

DESMODIUM TORTUOSUM (*D. molle*).—Valued for grazing in Leon County, Fla., where it is known as beggar weed. Other species of Desmodium form a part of the native pasturage and hay crop in the South.

ELEUSINE INDICA (crowfoot, big crowfoot, barn grass).—This, with crab grass, makes the great bulk of the "spontaneous" hay crop in most parts of the South. It is much more common than little crowfoot, which it resembles closely in habit, appearance, and quality. It is a larger plant, in fertile soil attaining a considerable height. It seems to do best in somewhat shaded ground. In an orchard

at Mobile I noticed a fine growth of it, averaging 3 to 3½ feet in height. Opinions differ as to its value. It is a rather tough grass, and becomes quite hard when growing in dry soil. I was told by several close observers that cattle will not touch it when grazing; and I noticed at Norfolk that cows browsing along the roadsides refused crowfoot altogether. Yet the general opinion is that, when cut young, it makes excellent hay, though troublesome to cure.

ERAGROSTIS CONFERTA.—Dr. Mohr tells me that this grass has some value for forage, being the only species of Eragrostis in the Southern States of any economic worth.

ERIOCHLOA MOLLIS.—This grass is frequent in the salt marshes of the St. Johns River near Jacksonville, Fla. It is a coarse, stout grass, usually 4 or 5 feet high, and would not produce a great bulk of forage yet is probably the best grass that will grow in brackish soil thereabouts, and might be useful as a constituent of salt-marsh hay. It does not grow in great quantity in any one place and would be hard for cattle to reach, as it makes its home along ditches and among bushes on the edges of the marshes, or with the rushes and cord grass that cover the marshes themselves. It might be worth cultivating in brackish meadows where better grasses could not be grown successfully. I did not learn that it had been tested as to its nutritive qualities, nor do I know of any English name for it.

GERMAN MILLET, OR HUNGARIAN GRASS (*Setaria italica germanica*).—Does well at Apalachicola and makes excellent fodder. A good field of it was seen at Savannah. Largely cultivated about Augusta, Ga. Seems to be well adapted to the soil and climate of the Gulf and South Atlantic States, and is much esteemed as fodder for horses.

HOLCUS LANATUS (meadow soft grass, velvet grass).—Abundantly naturalized along railways in western North Carolina and east Tennessee, and is frequent by roadsides near Norfolk, Va., preferring moist ground. I have seen it nowhere grazed by cattle.

HUNGARIAN GRASS. (*See* German millet.)

INDIAN CORN.—Nothing that is new can be said about this, which is beyond question the most important fodder plant of the Southern States.

ITALIAN RYE GRASS (*Lolium italicum*).—Judge R. C. Long, at Tallahassee, says he has had fair success with this grass.

JAPAN CLOVER (*Lespedeza striata*).—For pasturage Japan clover, or, as it is more often called, Lespedeza, is probably the most important plant of the Southern States, if the extent of the area over which it occurs in important quantities be considered. It is rarely sown, but grows without cultivation, and soon covers the most sterile soils. On poor soil it is fit only for grazing, but in moist, fertile ground it becomes large enough to cut for hay. Cattle are said to prefer it to any other plant, except, perhaps, Bermuda, whether for pasturage or fodder. It is less common immediately along the coast than in the great interior region of the South, where it has made itself at home almost everywhere. It does best where there is some lime in the soil, yet it will grow well where lime is nearly or quite absent. At Aiken, S. C., it was growing abundantly in the pine woods. Capt. W. W. Woolsey, at Aiken, told me that if Lespedeza hay be put in the rack with other kinds cattle invariably eat the Lespedeza first. Mr. Dibble, who has a large dairy farm near Aiken, is sowing a large part of his land with Lespedeza. At Knoxville, Tenn., it is claimed that this Lespedeza drives out broom sedge.

JOHNSON GRASS (*Sorghum halepense*).—Doubtless the most widely cultivated perennial hay grass in the South. In the bulk of forage produced it surpasses any plant commonly cut for hay in that section. Like most large, coarse grasses, it must be cut when quite young, as the stems and leaves afterwards become hard and dry. Its great drawback is the difficulty of eradicating it when it once

takes hold of a piece of land. Many valuable plantations in Alabama and Mississippi have been almost ruined by the hold Johnson grass has obtained on the land. It is said to be eradicable by close grazing for several successive seasons. The best Johnson grass observed was near Selma, Ala., not far from where it is said to have been originally introduced (near Montgomery). Here it is abundant and grows taller and larger than anywhere else. In the low country along the Gulf and Atlantic Coast I found but little of it, and that comparatively poor. Again, at Augusta, Ga., and at Aiken, S. C., I found it very good. It is evidently best adapted to the central portions of the Southeastern States.

KAFFIR CORN (*Sorghum vulgare* var.)—Cultivated at Aiken, S. C., with success. On a large dairy farm near Aiken it is cut for ensilage, being mixed with Indian corn.

KENTUCKY BLUE GRASS (*Poa pratensis*).—Mr. Matthews, who has charge of the Government grass garden at Knoxville, tells me that *Sisymbrium thaliana*, a small weed belonging to the hedge mustards, nearly crowded out the plot of Kentucky blue grass in early spring. Kentucky blue grass is said to do well in shaded soil at Tallahassee, but it is probably not well adapted to withstand the long, hot summers of the Gulf States.

LESPEDEZA STRIATA. (*See* Japan clover.)

LITTLE CROWFOOT. (*See Dactyloctenium ægyptiacum.*)

LOUISIANA GRASS. (*See Paspalum platycaule.*)

MAIDEN CANE.—This name is sometimes applied to *Panicum digitarioides*, a tall, branched grass with long, creeping rootstocks and rather broad leaves, found chiefly in ditches in the low country along the coast from North Carolina to Texas. It is of some value for forage, but it is not sufficiently abundant to be of much importance; and, as it usually grows in ditches, it is not easy for cattle to get at. If cut when young its hay would probably compare favorably with most native grasses of the South. Small plants often grow in considerable patches on railway embankments near Jacksonville, and by their strong, long, creeping rootstocks make excellent soil binders. The name maiden cane seems to be applied to other species of Panicum, probably to *P. scabriusculum* and *P. viscidum*. The former is a smooth grass growing in swamps and around ponds, mostly in the pine barrens, and having about the same range as *P. digitarioides*, which it much resembles. It is readily distinguished, however, by its "head," which is an open panicle, instead of a long, thin, narrow spike as in *P. digitarioides*. It is of about equal value. *Panicum viscidum* is a very common grass in the Southern States, inhabiting ditches, swamps, and borders of ponds. It is much like *P. scabriusculum*, but is downy all over. When old it is much branched, the long stems reclining on the ground or on other plants. It makes a considerable bulk of very sweet hay, and is said to be much relished by horses and cattle. It is probably one of the most valuable native grasses of the South.

MEXICAN CLOVER. (*See Richardsonia scabra.*)

MILLO MAIZE (*Sorghum vulgare* var.).—Both white and yellow millo maize yield very profitable crops at Aiken, S. C. On a farm near that place a single acre of the white variety is reported to have yielded in one season 35 tons of ensilage, two cuttings having been made.

MISSION GRASS. (*See Stenotaphrum americanum.*)

MUHLENBERGIA DIFFUSA (Nimble Will).—Dr. C. Mohr tells me that in northern Alabama, in the valley of the Tennessee, this is considered an excellent pasture grass for shaded grounds.

NIMBLE WILL. (*See Muhlenbergia diffusa.*)

NUT GRASS (*Cyperus rotundus*).—This plant, perhaps the most pernicious weed of the Southern States, is said to have some value besides that of its tubers as food for hogs. According to Capt. W. W. Woolsey, of Aiken, S. C., horses eat it readily.

OATS.—Oats do well in river bottoms at Apalachicola, and make good winter feed. Oats are successfully cultivated at Aiken, S. C.

ORCHARD GRASS does excellently well at Tallahassee, Fla.

PANICUM AGROSTOIDES.—This is one of the chief constituents of the hay cut in the Mobile River bottoms.

PANICUM ANCEPS occurs along ditches, usually in small quantity and among other plants. Where cattle can get at it they appear to relish it, but it is not abundant enough nor productive enough to be of importance.

PANICUM ANGUSTIFOLIUM.—A meadow examined at Mobile was almost covered with this grass in the drier parts. I was told that cattle are fond of it. It is a common plant in woods in the middle and low country, forming, doubtless, an important element of the woodland pasturage.

PANICUM CLANDESTINUM.—Found at Mobile, occurring along fences in low meadows. Said to make good forage when young.

PANICUM COLONUM.—This is a tender, succulent grass, and is considered good forage in the South. It is a low plant, but makes a considerable bulk of stem and leaf. I saw it only in ditches in the cities and towns, and it is not likely that it is anywhere abundant enough to afford more than an occasional bite. I doubt if it would flourish in any but moist, alluvial soil. It might be grown to advantage in good bottom land.

PANICUM COMMUTATUM.—Found usually in fertile woods, and is probably of some importance for woodland grazing.

PANICUM CRUS-GALLI (Barnyard grass).—This is occasionally met with as a weed along railways and in waste ground. It is a rank, succulent grass, making a considerable bulk of forage. The hay is probably of fair quality, though rather difficult to cure. Resembles *P. colonum*, though much larger, and might be valuable in a similar soil.

PANICUM CRUS-GALLI HISPIDUM.—This is a tall, coarse grass, covered with rough hair, growing in marshes. It often stools at the base, forming tufts of considerable size, and is therefore very productive. The stems, though large, are full of water and comparatively tender. Seen at Tallahassee and also at Apalachicola, where it was reported that horses relish it greatly. Mr. Lewis, a farmer at Apalachicola, considers it one of the best grasses for horses if kept cut close.

PANICUM DICHOTOMUM.—Grows in similar situations as *P. commutatum* and is of equal value. In the South it is found mostly in the upper districts.

PANICUM DIGITARIOIDES. (*See* Maiden cane.)

PANICUM FUSCUM.—Introduced at St. Augustine, where it grows in the streets. Produces a considerable bulk of stems and leaves and may have some value as a forage plant. Is large enough to cut for hay, but is rather harsh when cured.

PANICUM MELICARIUM.—Grows in wet, open ground and is common in the middle and low country. Though a small grass, producing no considerable bulk of forage, it usually grows in considerable quantity and makes quite an important element of the natural pasturage. It is tender and juicy, making a fine, sweet hay. I was told at Mobile that it is much relished by cattle.

PANICUM PAUCIFLORUM.—This is a woodland grass, mostly of the middle country. I found it abundant at Augusta and Aiken. It is doubtless of some little value as an element of the woodland pasturage.

PANICUM PROLIFERUM GENICULATUM. (*See* Water grass.)

PANICUM REPENS.—Grows along the shores of Mobile Bay. It is a tough, rather rigid grass, but I have noticed it cropped by cattle, so it may have some value among the scanty pasturage of seabeaches. It is a good sand binder.

PANICUM SCABRIUSCULUM. (*See* Maiden cane.)

PANICUM SEROTINUM.—This common grass of the coast region of the South disputes with Louisiana grass the honor of being the most valuable native pasture grass of that section. It is probably a biennial, sending out leafy, creeping shoots that root at every joint. It is much like crab grass, but smaller in every way,

with shorter leaves and of a lighter green color. It is too low to be valuable except for grazing, though it makes a fine, sweet hay, much like crab hay, but of finer quality. It is invaluable for pasturage, forming a close turf and driving out almost all other plants. It grows in sandy soil, preferring a little moisture, but growing well without it. At Apalachicola, I found the bulk of the pasturage composed of *Panicum serotinum*. I know no popular name for it. "Little crab grass" would be appropriate.

PANICUM VISCIDUM. (*See* Maiden cane.)

PANICUM WALTERI.—A plant of fertile woods, much more common in the middle and upper country than near the coast. Resembles *P. commutatum*, but is every way larger. What is said of the latter as a forage plant would apply to this.

PASPALUM CILIATIFOLIUM.—Grows usually in rather fertile soil, preferring shade. May possess some little value, although I have never observed it being eaten by cattle grazing in fields where it grows. It is common everywhere in the South.

PASPALUM DILATATUM.—Not uncommon in the South. Is usually met with along ditches, growing in large tufts. Although rather coarse, it makes abundant hay of good quality. Dr. C. Mohr thinks it one of the best of the Paspalums.

PASPALUM DISTICHUM.—A common plant of ditches, borders of ponds, and river banks. It is a tender, succulent grass, sending up abundant leafy shoots; but, as it rarely grows in any quantity where it can be got at easily, is not of much importance. A variety growing on the Gulf shore sends out long creeping shoots which root at each joint, making the plant an effective sand binder. At Apalachicola I noticed that cattle cropped the upright stems of this variety, but left the creeping ones.

PASPALUM FURCATUM.—This species is much like Louisiana grass in appearance and habit of growth, but is larger in every way. It grows in moist soil, often along pine-barren streams, or along ditches by roadsides. From the root are sent out short leafy shoots, which creep along the ground and root at the joints, making a close turf. I have seen it only in small quantities, but it should make excellent pasturage, being juicy and tender. It is said to be much esteemed on the prairies at Opelousas, La., where cattle fatten upon it rapidly. It is valueless for hay, the leaves being mostly near the ground and the stems almost naked and wiry. It is a plant of the low pine-barren region.

PASPALUM LÆVE.—A common species in the South, growing in fields and meadows and along roadsides. Has some value as an element of the native pasturage, but soon becomes tough and wiry.

PASPALUM MEMBRANACEUM.—Noticed at Mobile and at Jacksonville in moist, sandy soil along railway tracks. It is a small grass, but is very tender and succulent, and ought to make excellent pasturage where it grows in sufficient quanity. As it is a perennial, with creeping rootstocks, it should be valuable in permanent meadows where there is sufficient moisture. For that purpose it might be mixed with Louisiana grass or with *Panicum serotinum*, if able to hold its own with them.

PASPALUM PLATYCAULE (Louisiana grass).—This grass is highly prized in the low country, though apparently not generally known as "Louisiana grass." It prefers moist, sandy, open ground, in such situations forming a close, tender turf. Dr. Mohr says that it shoots up with the first warm days of spring and affords grazing nearly all the year around. It is much like *Paspalum furcatum*, but is considerably smaller. It is abundant where it grows, and is probably the most valuable native pasture grass of that region. At Mobile I saw a large pasture, belonging to a dairyman, covered almost exclusively with Louisiana grass supporting a dozen or so of cows in fine condition. At Savannah I saw it larger and better than at any other point.

PASPALUM PLICATULUM.—Grows in tufts in dry, sandy, open ground in the pine barrens. I saw it from Mobile to Savannah. It is said to furnish fairly good

grazing when young, but soon becomes dry and the stems wiry. However, it is probably a better grass than most of those of the dry pine barrens. I saw it growing in dry soil on the banks of an artificial lake at Mobile, where the short, strong rootstocks made excellent soil binders.

PASPALUM PRÆCOX.—This species grows along ditches and streams and about ponds in the pine barrens. It is an erect grass with but little leafage, but is doubtless relished by cattle ranging the pine barrens, for when young it is quite tender and juicy.

FIG. 5.—Louisiana grass (*Paspalum platycaule*).

PASPALUM PURPURASCENS.—Grows in moist ground, preferring a rather heavy soil. I found it abundant in the middle and low country, and am convinced that it is one of the best hay grasses of the South. It grows in tufts and usually occurs in considerable quantities, crowding out most other grasses. It reaches a height of 4 feet or so, is perfectly smooth, very tender, and so sappy that the hands are wet in breaking a single stalk. It makes a good bulk of very sweet hay, although rather slow in drying. It is readily recognized by the red-purple color assumed by the leaves and stems toward the base I found it common from Mobile to Wilmington along the coast and as far back as Augusta

PEARL MILLET.—I noticed a small quantity of this cultivated at Jacksonville but not doing well, perhaps on account of the dryness of the soil where it was grown.

POA ARACHNIFERA. (*See* Texas blue grass.)

POA COMPRESSA (Wire grass, English blue grass).—In the Government grass garden at Knoxville is a plot of this and Bermuda in mixture, forming an extremely dense turf. This mixture had endured for several years, neither grass having obtained a decided advantage over the other. Mr. Matthews, in charge of the garden, tells me that in spring and early summer, before the Bermuda begins to grow, the blue grass gets a good growth, and again in the fall when the growth of the Bermuda has ceased, so that one grass or the other would afford grazing throughout the season. In view of this, and of the ability of both grasses to withstand drought, this may prove a valuable mixture for the South. But it is doubtful whether the English blue grass will grow to advantage much farther South. The blue grass may ultimately conquer the Bermuda, as its rootstocks penetrate much deeper into the soil. Dr. Mohr says *Poa compressa* is spreading rapidly in northern Alabama and is proving very valuable. He thinks it would finally drive out Bermuda if planted with it.

POA PRATENSIS. (*See* Kentucky blue grass.)

RED CLOVER.—Said to do well at Tallahassee. It is successfully grown at Augusta, Ga.

REDTOP (*Agrostis alba vulgaris*).—This grass is not uncommon in moist ground along railways and about wharves in the Gulf States, often growing vigorously in such places. I see no reason why it could not be grown successfully in the low country if given a moist, rather heavy soil. I am inclined to think that redtop could be cultivated to better advantage in that section than timothy, orchard grass, or the other staple hay grasses of the North.

RESCUE GRASS (*Bromus unioloides*).—Dr. C. Mohr considers this a valuable grass in southern Alabama. Judge R. C. Long says it does fairly well at Tallahassee.

RICE.—Rice is grown by Mr. Lewis at Apalachicola for horse feed, for which he thinks it about as valuable as corn.

RICHARDSONIA SCABRA (Mexican clover).—This plant often appears in cultivated land after the crop has been taken off, and is usually associated with crab grass. I saw it nowhere large enough to make good hay. Opinions differ as to its worth. Dr. C. Mohr thinks it of some value. Judge R. C. Long, of Tallahassee, does not esteem it and keeps it out of his land. A gentleman who resides near Thomasville, Ala., described a succulent plant of sandy bottoms under the name of "water pusley," which I think must be the Richardsonia. He says it is very palatable to cattle and is excellent for green manuring.

SEA OATS. (*See Uniola paniculata.*)

SETARIA CORRUGATA.—Occurs in cultivated land near the coast and is sometimes an important element of the spontaneous hay crop. It is not productive enough to be of much importance.

SETARIA GLAUCA (Pigeon grass, yellow foxtail).—What has been said of *Setaria corrugata* will apply to this species also, though *S. glauca* is more productive.

SETARIA GLAUCA LEVIGATA.—This variety is found chiefly along the coast, although I noticed it at one point in the interior (at Augusta, Ga.). At Mobile I saw it in moist but not brackish ground, making a heavy growth and promising a large bulk of hay. It seems to be much more productive than common pigeon grass, and might be valuable for river bottoms. It grows in both fresh-water and brackish swamps.

SETARIA ITALICA GERMANICA. (*See* German millet.)

SIDA SPINOSA.—Judge R. C. Long informs me that this plant, though now abundant at Tallahassee, is a recent introduction there; says it is admirable for restoring exhausted top soils, as the roots extend deep into the subsoil, and that it makes very good winter grazing for cattle.

SMUT GRASS. (*See Sporobolus indicus.*)

SORGHUM HALEPENSE. (*See* Johnson grass.)

SORGHUM VULGARE. (*See* Kaffir corn and Millo maize.)

SPOROBOLUS INDICUS (Smut grass).—This grass, everywhere naturalized in fields and waste ground in the South, is much esteemed for pasturage, especially for horses. As it grows in tufts, sending out no shoots, it does not make a close turf. Capt. W. W. Woolsey, of Aiken, objects to it on this account. It is said to be highly nutritive. It will grow in very poor soil, but requires fertile land for its best development, under such conditions producing a considerable quantity of forage. Judge R. C. Long, of Tallahassee, thinks so highly of smut grass that he intends to plant a large area of land with it exclusively.

FIG. 6.—St. Augustine grass (*Stenotaphrum americanum*).

SPOROBOLUS VIRGINICUS.—This is a small grass growing on beaches along the coast. Its slender, creeping rootstocks, sending up tufts of stems at intervals, make it an excellent sand binder. The foliage is tender and may possess some value for seaside pasturage.

SPUR GRASS. (*See Cenchrus echinatus.*)

STENOTAPHRUM AMERICANUM (St. Augustine grass, Mission grass).—The lawn of Judge R. C. Long, at Tallahassee, is composed almost entirely of this grass, and I saw several other lawns at the same place composed solely of mission grass. I saw it also planted along the streets in Savannah. It makes a dense turf when kept close cut, and has a fresh, green color when growing in good soil. It is as well adapted to resist drought as Bermuda, and certainly makes a brighter, prettier lawn than that grass does. Judge Long says that with its

long, creeping shoots rooting at the joints it drives out all other grasses, even Bermuda, but is easily eradicated itself by plowing under. At St. Augustine, where it grows about the old Spanish fort, Bermuda grass was getting the better of it. Judge Long plants the grass as Bermuda is usually planted—by plowing with a hand plow, and placing short pieces of the stems in the furrows, and covering lightly with soil. It is a tender, succulent grass, in good soil making a considerable quantity of forage, and is said to be excellent for sheep pastures. It owes its name "mission grass" to its occurrence about the old missions in Florida and other States, where it was doubtless introduced by the Spaniards.

SWEET POTATO.—Capt. W. W. Woolsey, of Aiken, considers sweet potatoes excellent for horses, feeding about a peck each day with half rations of corn or oats. The vines he dries on racks and feeds as hay.

TEXAS BLUE GRASS (*Poa arachnifera*).—Judge R. C. Long stated that this grass flourishes in the stiff red-clay soil of Leon County, Fla., but does not thrive in thin sandy soils. Capt. W. W. Woolsey, at Aiken, has had good success with this grass, which affords excellent grazing late in winter and in spring. On his lawn it grows with Bermuda, neither grass seeming to crowd out the other. It took him about three years to get a good stand of it.

TRIPSACUM DACTYLOIDES.—A farmer at Apalachicola told me that this makes good fodder for horses if cut when young.

UNIOLA PANICULATA (Sea oats).—Grows in the sand of seabeaches, a little way above high tide. It is an excellent sand binder, its rootstocks being very strong and penetrating deep into the soil, much like those of marram grass, of which it is the Southern analogue. On St. Georges Island, off Apalachicola, Fla., I noticed the leaves cropped by cattle, but it is too tough and dry to be of any importance as a forage plant.

WATER GRASS (*Panicum proliferum geniculatum*).—This is a common grass of moist ground in the low country, found usually in alluvial river bottoms. It is a large, succulent grass, a rank grower, sometimes 7 feet high, the stout stems rooting at the lower joints. It produces a large bulk of stem and leaves, and is perhaps the most important native hay grass for bottom lands in the South. Is known and highly valued almost everywhere in that section. A physician of Thomasville, Ala., considers this, next to crab grass, the best forage plant of that part of the country

WIRE GRASS. (*See Aristida stricta.*)

PART II.

LIST OF GRASSES COLLECTED OR OBSERVED IN THE SOUTHEASTERN STATES FROM JUNE TO AUGUST, 1895.

MAYDEÆ.

Tripsacum dactyloides L.—Selma and Mobile, Ala.; Apalachicola, Fla.; Aiken, S. C.; Wilmington, N. C., in swales, along ditches, in graveyards, etc.

ANDROPOGONEÆ.

Elionurus tripsacoides HBK.—St. Georges Island. Fla., in dry pine barrens, growing in tufts among bushes. Culms slender, strict, 3 or 4 feet high, in tufts from short rootstocks. The roots have the delightful odor of vitivert (*Andropogon squarrosus*).

Andropogon argyræus Schult.—Aiken, S. C., in dry soil along railway.

Andropogon argyræus macra Scribn.—Jacksonville, Fla., dry, open ground in the pine barrens. Culms tall (nearly 6 feet), slender, little branched; whole plant glaucous. Very different in appearance from *A. argyraeus*. It is A. H. Curtiss's, No. 4952 (1894).

Andropogon Elliottii Chapm.—St. Georges Island, Fla., in dry pine barrens.

Andropogon provincialis Lam.—Aiken, S. C., in dry soil, hilly pine woods.

Andropogon scoparius Michx.—Hiwassee Gorge, Polk County, Tenn., in dry, sterile soil. Not in flower.

Andropogon Sorghum Halepense Brot.—Selma, Ala.; Augusta, Ga.; Aiken, S. C., in fields, at roadsides, etc.

PANICEÆ.

Paspalum ciliatifolium Michx.—Selma, Ala.; Tallahassee, Apalachicola, and Jacksonville, Fla.; Savannah, Ga.; Wilmington, N. C., fields, roadsides, etc. The ordinary form, found usually in rather fertile, shaded ground, is almost perfectly smooth, except the ciliate margins of the leaves. A very hairy form, growing in dry, sterile soil, observed at Mobile, Tallahassee, and Savannah, is probably *P. dasyphyllum* Ell.

Paspalum difforme Le Conte.—Mobile, Ala.; Jacksonville, Fla., in rather fertile soil along railway tracks. Resembles *P. floridanum glabratum*, but smaller in every respect.

Paspalum dilatatum Poir.—Mobile, Ala.; Augusta, Ga., in moist ground along ditches.

Paspalum distichum L.—Knoxville, Tenn.; Mobile, Ala.; Apalachicola and Jacksonville, Fla.; Wilmington, N. C., in ditches, about ponds, river banks, and ocean beaches. On the beach at Apalachicola I found sterile shoots 6 feet or more in length, making excellent sand binders. A small form (*P. vaginatum* Sw.?), found in moist soil on the beach at Apalachicola, lacked the characteristic bluish color of the species.

Paspalum floridanum Michx.—Selma and Mobile, Ala.; Jacksonville, Fla.; Savannah and Augusta, Ga.; Aiken, S. C.; Wilmington, N. C., in moist or dry, open ground. Varies considerably in degree of pubescence.

Paspalum floridanum glabratum Engelm.—Mobile, Ala.; Jacksonville, Fla., moist, open ground, usually along railways, less frequent than *P. floridanum*, flowering at the same time. Very conspicuous for its blue-glaucous color, which extends even to the spikelets. Is probably a distinct species.

Paspalum furcatum Flugge.—Jacksonville, Fla.; Savannah, Ga.; Wilmington, N. C. moist, open ground along ditches and streams in the pine barrens.

Paspalum lævе Michx.—Selma, Ala.; Tallahassee and Jacksonville, Fla.; Savannah, Ga.; Aiken, S. C.; Wilmington, N. C.; Norfolk, Va., fields, roadsides, moist meadows, etc. Varies from very hairy to quite smooth, and in the size of the spikelets. A form collected at Jacksonville, very smooth, with several spikes, seems to approach *P. purpurascens.*

Paspalum membranaceum Walt.—Mobile, Ala.; Jacksonville, Fla., moist, sandy, soil, along railway tracks; not common.

Paspalum platycaule Poir.—Selma and Mobile, Ala.; Tallahassee and Jacksonville, Fla.; Savannah, Ga., moist, sandy soil in low meadows, roadsides, etc., usually very abundant.

Paspalum plicatulum Michx.—Mobile, Ala.; Jacksonville, Fla.; Savannah, Ga., very dry open ground in the pine barrens. Resembles *P. lævе,* but is more rigid.

Paspalum præcox Walt.—Mobile, Ala.; Jacksonville, Fla.; Savannah, Ga.; Wilmington, N. C., about ponds and along ditches and streams in the pine barrens, in moist ground. Varies in degree of pubescence. Seems to flower "off and on" all summer.

Paspalum purpurascens Ell.—Mobile, Ala.; Jacksonville, Fla.; Savannah and Augusta, Ga.; Denmark, S. C.; Wilmington, N. C., in low meadows and along streams, in moist, rather heavy soil; common.

Paspalum setaceum Michx.—Mobile, Ala.; Tallahassee and Jacksonville, Fla.; Savannah and Augusta, Ga.; Wilmington, N. C., in dry, sandy soil at roadsides and in fields; common in the pine barrens. Very distinct from *P. ciliatifolium.*

Paspalum virgatum pubiflorum Vasey.—Mobile, Ala., along a ditch in the city; introduced. Lower sheaths rough hirsute.

Anthænantia villosa Benth.—Jacksonville, Fla., dry, sandy soil in pine barrens; frequent.

Amphicarpum floridanum Chapm.—Jacksonville, Fla., especially abundant upon railway embankments, also at roadsides and in cultivated fields, in rather loose, dry soil. Grows often in large patches, the slender, branched, creeping root-stocks making it an excellent soil binder.

Eriochloa mollis Kunth.—Jacksonville, Fla., brackish marshes of St Johns River. Sometimes over 5 feet high.

Panicum amarum minus Vasey and Scribn.—Norfolk, Va., ocean beaches, in drifting sands, just above high tide. Great majority of plants small and sterile. Root-stocks not penetrating deep, but much branched, making excellent sand binders.

Panicum anceps Michx.—Tallahassee and Jacksonville, Fla.; Savannah, Ga.; Wilmington, N. C., along ditches, usually in shaded ground. Plant collected at Wilmington is the large, nearly smooth, northern form, with larger spikelets. The others belong to the small-flowered southern form (*P. anceps pubescens* Vasey), with the lower sheaths pubescent or villous, whole plant often becoming purplish when growing in dry, open ground.

Panicum angustifolium Ell.—Mobile, Ala.; Augusta, Ga.; Aiken, S. C.; Wilmington, N. C. Two well-marked forms: one small, compact, much branched, growing in dry, open ground; the other larger, more straggling, less branched, darker green, preferring moist ground in the pine barrens.

Panicum autumnale Bosc.—Selma, Ala.; Augusta, Ga.; Aiken, S. C., dry, sandy soil, fields and roadsides, abundant at Augusta and Aiken. Leaves glaucous. Callus at base of panicle branches very prominent at period of flowering, glistening when held to the light, as if full of water.

Panicum baldwinii Nutt. in Herb. Phila. Acad. (*Panicum nitidum minor* Vasey Contr. U. S. Nat. Herb. 3: No. 1, 30, 1892).—Carrabelle and Jacksonville, Fla.; Savannah, Ga.; Wilmington, N. C., in fertile pine woods, or in moist, open ground.

Varies greatly in size, degree of branching, length of leaf, etc. The Wilmington plant, growing in low, wet, open ground, is minutely pubescent.

Panicum barbulatum Michx.—Polk County, Tenn.; Tallahassee, Fla.; Savannah and Augusta, Ga.; Wilmington, N. C., in moist, fertile, shaded ground along streams. At Savannah specimens were collected of a *Panicum* with the habit, panicle, and spikelets of *P. barbulatum*, but smooth at the nodes.

Panicum ciliatum Ell.—Mobile, Ala.; Apalachicola and Jacksonville, Fla.; Wilmington, N. C., dry soil in pine barrens. Is certainly a distinct species.

Panicum clandestinum L.—Knoxville, and in Polk County, Tenn.; Mobile, Ala.; Wilmington, N. C., low fertile ground in thickets along streams.

Panicum colonum L.—Mobile, Ala.; Tallahassee, Fla., in ditches in the stree

Panicum commutatum Schult.—Knoxville, and in Polk County, Tenn.; Tallahassee and Jacksonville, Fla.; Augusta, Ga.; Norfolk, Va., in fertile woods. Varies much in size, length and breadth of leaves, etc.

Panicum crus-galli L.—Mobile, Ala., moist ground along railway.

Panicum crus-galli hispidum Torr.—Tallahassee and Apalachicola, Fla., in open swamps. Nearly 6 feet high at Tallahassee. Certainly native. Panicle lighter colored than in *P. crus-galli.*

Panicum demissum Trin.—Jacksonville, Fla.; Savannah, Ga., fertile open soil in pine barrens. It is No. 4029, A. H. Curtiss (1893).

Panicum dichotomum L.—Knoxville, and in Polk County, Tenn.; Aiken, S. C.; Norfolk, Va., in dry, fertile woods. Typical *P. dichotomum* seems to be scarce or altogether wanting in the low country.

Panicum digitarioides Carpenter.—Jacksonville, Fla.; Wilmington, N. C., in ditches and swamps. Ordinarily quite smooth. Small, sterile plants sometimes straggle into dry, open ground, especially upon railway embankments, and, with their branching rootstocks, make excellent soil binders. In such situations the plants are quite hairy. At Jacksonville these small plants often grow in large patches with *Amphicarpum floridanum*, which they somewhat resemble. The slender, spike-like, greenish panicles stand out at an angle to the axis of the culm.

Panicum filiforme L.—St. Georges Island, Fla.; Augusta, Ga., in dry soil. The southern form is larger, less strict, and more leafy at base than the northern.

Panicum fuscum Sw.—St. Augustine, Fla., sidewalks and vacant lots near the beach. Grows in tufts of considerable size, the culms reclining and rooting at the joints toward the base.

Panicum gibbum Ell.—Mobile, Ala.; Apalachicola and Jacksonville, Fla.; Augusta, Ga., in moist ground, in thickets and fence rows, and along ditches and streams. The weak culms recline on the ground unless supported by other objects.

Panicum lanuginosum Ell.—Polk County, Tenn.; Aiken, S. C.; Wilmington, N. C.; Norfolk, Va., in dry, open woods, apparently more common in the middle and upper country.

Panicum laxiflorum Lam.—Tallahassee and Jacksonville, Fla.; Augusta, Ga., fertile, wooded hillsides or low woods. The southern form is smaller and narrower leafed than the northern.

Panicum longipedunculatum Scribn.—Wilmington, N. C., in pine barrens, preferring rather moist soil.

Panicum melicarium Michx.—Selma and Mobile, Ala.; Jacksonville, Fla.; Savannah and Augusta, Ga.; Aiken, S. C., wet, sandy, open ground; common.

Panicum nodiflorum Lam. (?)—Mobile, Ala.; Wilmington, N. C.; Norfolk, Va., low meadows. Culms in tufts, sometimes 2 feet high, becoming much branched (not dichotomously), purplish; sheaths ciliate at throat and along edges with long, lax hairs, plant otherwise smooth (in Wilmington specimens leaves also ciliate); primary panicle small, many-flowered; secondary axillary panicles numerous, barely exserted, few-flowered; spikelets one-half line long, obovate,

often becoming dark purple; empty glumes minutely pubescent. I think this must be a good species. It is represented in the National Herbarium by specimens from several localities, all in the coast region. It seems to be nearest *P. barbulatum*, but can hardly be referred to that species.

Panicum pauciflorum Ell.—Augusta, Ga.; Aiken, S. C., dry soil in pine barrens.

Panicum proliferum Lam.—Augusta, Ga., low ground at roadside.

Panicum pubescens Lam.—Mobile, Ala.; Augusta, Ga.; Aiken, S. C.; Wilmington, N. C., dry, barren woods. Varies somewhat in size of spikelets.

Panicum ramulosum Michx.—Jacksonville, Fla.; Aiken, S. C.; Wilmington, N. C., sphagnum swamps. It is No. 500 of Nash's Florida collection. The Jacksonville plant has stouter and more rigid culms than the common form. The same form was collected by S. M. Tracy on Horn Island, Mississippi.

Panicum ramulosum Michx.—Mobile, Ala.; Apalachicola and Carrabelle, Fla.; Wilmington, N. C., moist or dry soil in pine barrens, a smaller, more erect form, with culms less leafy toward summit, corresponding to *P. ensifolium* Baldw.

Panicum repens L.—Mobile, Ala., about wharves in the city and shores of Mobile Bay at least as far as Dog River (10 miles below Mobile).

Panicum sanguinale L.—At all points visited, in cultivated ground, roadsides, etc.

Panicum sanguinale ciliare Retz.—Carrabelle, Fla.. along railway. Small specimens.

Panicum scabriusculum Ell.—Mobile, Ala.; Wilmington, N. C., in pine barren swamps. I have never seen this species producing the lateral autumnal panicles so abundant in *P. viscidum*.

Panicum serotinum Trin.—Mobile, Ala.; Tallahassee, Apalachicola, and Jacksonville, Fla.; Savannah, Ga.; Wilmington, N. C., dry or moist sandy soil. Dr. Charles Mohr has never been able to determine whether this plant is annual or perennial. Its delicate, fibrous roots, having but a slight hold on the soil, seem to belong to an annual, while its creeping stems and early appearance in spring point to its being perennial. It is not improbably a biennial.

Panicum sphærocarpum Ell.—Selma and Mobile Ala.; Jacksonville, Fla.; Savannah and Augusta, Ga.; Aiken, S. C.; Wilmington, N. C.; Norfolk, Va., in woods and on banks in dry, usually fertile, soil. Quite variable in size and habit.

Panicum stenodes Griseb.—Mobile, Ala.; Jacksonville, Fla., in wet pine barrens; scarce at Mobile, common about Jacksonville.

Panicum virgatum L.—Mobile, Ala.; Jacksonville, Fla.; Wilmington, N. C.; Norfolk, Va., usually growing in dry soil, but near streams or ditches. At Wilmington, in moist pine-barrens, a slender, reduced form with few-flowered panicles was collected.

Panicum viscidum Ell.—Selma and Mobile, Ala.; Jacksonville, Fla.; Savannah, Ga.; Wilmington, N. C.; Norfolk. Va., in swamps and along ditches; very common.

Panicum walteri Poir.—Knoxville, and in Polk County, Tenn.; Tallahassee, Fla.; Savannah, Ga., in fertile woods. All specimens collected had bearded nodes.

Setaria corrugata Schult.—Apalachicola, Jacksonville, and St. Augustine, Fla., in cultivated fields and waste ground. Grows in tufts, often of considerable size. The St. Augustine plant has the corrugations of the flowering glume less prominent.

Setaria glauca Beauv.—Mobile, Ala.; Savannah and Augusta, Ga.; Norfolk, Va., cultivated ground and roadsides.

Setaria glauca lævigata Chapm.—Mobile, Ala.; Apalachicola, Fla.; Augusta, Ga., in moist ground along ditches beside railway tracks; at Apalachicola in salt marshes along the coast. This, I think, is almost certainly a native grass and is, in all probability, a distinct species. It is easily recognized by its flattish culms, very glaucous leaves, and shorter spikes, with longer bristles than those of *S. glauca*. The rootstocks are short, knotted, horizontal, somewhat reminding one of those of *Muhlenbergia Mexicana*.

Setaria imberbis R. & S.—Mobile, Ala., about wharves; introduced from South America.

Cenchrus echinatus L.—Tallahassee and Jacksonville, Fla., in cultivated fields; at Jacksonville common in waste ground in the city.

Cenchrus incertus M. A. Curtis.—Mobile, Ala.; Augusta, Ga., in dry, sandy soil; at Augusta in cornfields.

Cenchrus tribuloides L.—Tallahassee, Carrabelle, Apalachicola, and Anastasia Island Fla.; Wilmington, N. C., in dry, sandy soil, seabeaches, roadsides, etc Contains at least two varieties or possibly species. One (collected at Wilmington) has rather few, large involucres with stout spines. The other (collected at Tallahassee and Apalachicola) is a more slender plant, with more numerous, smaller involucres with slender, straw-colored spines. On Anastasia Island was collected a form of the large-flowered variety with long, straggling culms that support themselves on the bushes.

Stenotaphrum americanum Schrank.—St. Augustine, Fla., along Marine street and about the old fort. Probably originally planted there. Saw a number of seedlings growing out of the coquina walls of the fort itself.

ORYZEÆ.

Hydrochloa Caroliniensis Beauv.—Mobile, Ala.: Augusta, Ga., in clear, usually running water, most frequent in the pine barrens. Abundant about Mobile. Not seen in flower. The slender culms are often 2 feet or more in length, rooting at the lower nodes. In shallow water the summits of the culms appear above the surface, while in deeper water the uppermost leaves float upon the surface. Leaf blades dull green above, purplish beneath.

Zizaniopsis miliacea Doell & Asch.—Mobile, Ala.; Apalachicola, Fla.; Wilmington, N. C., in swamps and ditches, preferring alluvial mud. Sterile shoots erect, flowering ones strongly geniculate, rooting at the joints.

Zizania aquatica L.—Wilmington, N. C.; Suffolk and Norfolk, Va., in marshes near the sea.

Leersia hexandra Sw.—Mobile, Ala.; Tallahassee and Jacksonville, Fla.; Wilmington, N. C., swamps, ditches, and borders of ponds. Much taller in Mobile River swamps, where it grew among *Spartina polystachya*, than I have seen it elsewhere. There, and at Wilmington, the spikelets were largely affected with an ergot-like disease. Specimens collected at Tallahassee have very large flowers. Spikelets reddish brown, turning a dull brown purple.

Leersia oryzoides Sw.—Norfolk, Va., in bogs.

AGROSTIDEÆ.

Aristida gracilis Ell.—Jacksonville, Fla., upon a railway embankment. A large form, same as No. 4043, A. H. Curtiss (1893).

Aristida purpurascens minor Vasey.—Apalachicola and Jacksonville, Fla., dry, sandy soil, in the open.

Aristida spiciformis Ell.—Apalachicola, Fla., in moist pine barrens.

Aristida stricta Michx.—Apalachicola, Fla.; Aiken, S. C.; Wilmington, N. C., dry pine barrens; abundant almost everywhere in the low country.

Stipa avenacea L.—Wilmington, N. C., in dry pine barrens. Still in flower August 3.

Stipa Neesiana Trin.—Mobile, Ala., about wharves; introduced from South America.

Muhlenbergia capillaris trichopodes Vasey.—Jacksonville, Fla., in dry soil, but always near ditches. The panicle has a whitish color.

Muhlenbergia Mexicana Trin.—Knoxville, Tenn., banks of Tennessee River; not yet in flower.

Phleum pratense L.—Polk County, Tenn.; Selma and Mobile, Ala.; Apalachicola, Fla.; Norfolk, Va., along railways and roadsides. At Mobile and Apalachicola a small form grew among driftwood on the beach.

Sporobolus curtissii Small (*Sporobolus floridanus curtissii* Vasey, in herb.).—Jacksonville, Fla., in pine barrens, growing in open ground along railways. A much

smaller, narrower-leafed, and in every way more delicate plant than *S. floridanus*. It grows in similar situations, but is much more common about Jacksonville. It is A. H. Curtiss's Nos. 4053, 5181.

Sporobolus floridanus Chapm.—Apalachicola and Jacksonville, Fla., rather moist ground in pine barrens. Grows in strong tufts, the dried sheaths at base of culms becoming hard and polished.

Sporobolus indicus R. Br.—Selma and Mobile, Ala.; Tallahassee, Apalachicola, and Jacksonville, Fla.; Savannah and Augusta, Ga.; Aiken, S. C.; Wilmington, N. C., fields, roadsides, and along streets in the cities; almost everywhere in the South. Varies much in size and in the shape of the panicle, which is sometimes very narrow and spike-like, sometimes more open, with longer branches. Usually affected with smut.

Sporobolus junceus Kunth.—Jacksonville, Fla.; Aiken, S. C.; Wilmington, N. C., in dry pine barrens. In flower at Wilmington August 3.

Sporobolus virginicus Kunth.—St. Georges Island, Florida, on the beach, with *Paspalum distichum*. The slender, rather deep-seated rootstocks send up tufts of culms at intervals. As is usually the case with grasses with creeping rootstocks, a majority of the plants are sterile.

Agrostis alba vulgaris Thurb.—Polk County, Tenn.; Selma, Ala.; Jacksonville, Fla.; Savannah, Ga.; Norfolk, Va., along railway tracks, at roadsides, and about wharves. The form collected at Selma, Jacksonville, and Savannah is slender, very glaucous, with numerous sterile shoots, and grows in moist soil. In Polk County, Tenn., besides the ordinary "redtop," a slender, strict form, about 1 foot high, with small panicles, was collected along the Marietta and North Georgia Railroad in the Hiwassee Gorge.

Agrostis alba L. var.—Hiwassee Gorge, Polk County, Tenn., in wet ground. A large, succulent form, with stout geniculate culms and large panicles.

Agrostis scabra Willd.—Polk County, Tenn.; Augusta, Ga.; Aiken, S. C.; Wilmington, N. C., in fields and roadsides.

Cinna arundinacea L.—Norfolk, Va., in marshes.

Ammophila arenaria Link.—Elizabeth River Beach, near Norfolk, Va., just above high tide. Grows in large patches, with here and there a fertile plant. Smaller here than farther north.

AVENEÆ.

Holcus lanatus L.—Asheville, N. C.; Polk County, Tenn.; Norfolk, Va., moist ground, roadsides, and along railway tracks.

Trisetum palustre Torr.—Hiwassee Gorge, Polk County, Tenn., on a wet rock—a single specimen.

Avena sativa L.—Hiwassee Gorge, Polk County, Tenn., adventitious along railway.

Danthonia sericea Nutt.—Mobile, Ala.; Aiken, S. C., dry pine barrens; past flowering.

Danthonia spicata Beauv.—Knoxville, Tenn.; Polk County, Tenn., dry soil, woods and fields.

CHLORIDEÆ.

Cynodon dactylon Pers.—At every point visited, except Polk County, Tenn. On the beach at Apalachicola occurs a reduced form, with small leaves and short flowering culms and spikes, which produces sterile shoots sometimes 7 feet long, making an admirable sand binder. Along the railway track opposite Augusta I found the large form 3 feet high.

Spartina densiflora Brongn.—Apalachicola and St. Georges Island, Fla., in the sea marshes, with *S. juncea*. Resembles *Ammophila* in habit and in the spike-like panicle, which is often purplish. Culms sometimes nearly 5 feet high. Rootstock penetrates deep into the sand, rooting at intervals, like that of *Ammophila*.

Spartina juncea Ell.—Mobile, Ala.; Apalachicola, St. Georges Island, and Jacksonville, Fla.; Norfolk, Va., in brackish marshes and on seabeaches. The southern form is much larger than the ordinary form of the New England and Middle States. When growing on beaches it sends out stolons, often 3 feet long, with purplish, polished scales. It takes firm hold of the sand and is excellent for binding it.

Spartina polystachya Ell.—Mobile, Ala.; Apalachicola, Fla.; Savannah, Ga.; Wilmington, N. C.; Suffolk and Norfolk, Va., in brackish marshes.

FIG. 7.—Toothache grass (*Ctenium americanum*).

Ctenium americanum Spreng.—Mobile, Ala.; Apalachicola and Jacksonville, Fla.; Wilmington, N. C., low, wet pine barrens. The bud of next season on the rootstock is snugly protected by the scaly bases of old leaf sheaths that clothe the base of the culm. The spikes, while young, stand out at right angles to the culm; but as they mature they become more or less curled. Occasionally a second smaller spike occurs, attached at the same point. This might be considered a vestige of the digitate inflorescence of other *Chlorideæ*. The leaves are quite glaucous beneath. When young, *Ctenium* has not much odor, but as the plants grow older, especially when exposed to the sun, the whole plant exhales a fragrance not unlike that of *Melissa officinalis*. I did not find the rootstock very pungent to the taste at this season.

Chloris glauca Vasey.—Jacksonville, Fla., in dry soil along a ditch near St. Johns River. This and the next species are probably biennial, the tufts of leaves at

the roots remaining green after the rest of the plant has become dry. The small fibrous roots can hardly belong to a perennial. The culms are strongly geniculate, sometimes 4 feet high It is a very handsome plant.

Chloris Swartziana Doell.—Apalachicola and St Augustine, Fla., dry, sandy soil.

Gymnopogon brevifolius Trin.—Jacksonville, Fla., in moist, open ground.

Gymnopogon racemosus Beauv.—Aiken, S. C., fertile, wooded hillside.

Eleusine indica Gaertn.—At every point visited. In the streets of Savannah specimens with viviparous spikelets were collected. The spikelets were metamorphosed into tiny branches with well developed leaves, showing a perfect definition of sheath and blade.

Dactyloctenium ægyptiacum Willd.—Selma, Ala.; Tallahassee, Fla.; Savannah, Ga.; Aiken, S. C., roadsides and cultivated ground. Along the sidewalks at Savannah a small form, with short and compartively thick spikes, was collected.

Leptochloa mucronata Kunth.—Mobile, Ala., in cultivated ground.

FESTUCEÆ.

Phragmites communis Trin.—Mobile, Ala., in swamps of Mobile River. Not yet in flower (July 7).

Triodia ambigua Vasey.—Mobile, Ala.; Jacksonville, Fla., along ditches, in open ground, in the pine barrens. Grows in tufts; leaves glaucous.

Triodia cuprea Jacq.—Augusta, Ga., fertile soil along railway.

Triplasis americana Beauv.—Aiken, S. C., sterile, sandy soil, in the open.

Triplasis purpurea Beauv.—Carrabelle and Apalachicola, Fla.; Norfolk, Va., sea-beaches.

Eragrostis bahiensis Schult.—Mobile, Ala., about wharves; introduced from South America.

Eragrostis brownei Nees (?).—Tallahassee, Fla.. along railway tracks. A handsome little plant, with bunches of bright-green radical leaves and small brown-purple panicles spreading out upon the ground. It is Nash's No. 1611.

Eragrostis ciliaris Link.—Apalachicola, Fla., in Dr. Chapman's garden.

Eragrostis major Host.—Norfolk, Va., roadsides.

Eragrostis nitida Chapm.—Savannah, Ga., along railway track.

Eragrostis pectinacea Steud.—Augusta, Ga.; Norfolk, Va., dry, sandy fields.

Eragrostis pilosa Beauv.—Mobile, Ala.; Tallahassee, Fla.; Augusta, Ga.; Aiken, S. C.; Norfolk, Va., roadsides and waste ground.

Eragrostis plumosa Link.—Carrabelle and Apalachicola, Fla., gardens and waste ground.

Eragrostis purshii Schrad.—Selma, Ala., along railway in moist ground.

Eragrostis refracta Scribn.—Tallahassee, Apalachicola, and Jacksonville, Fla.; Augusta, Ga.; Aiken, S. C.; Wilmington, N. C., in moist or dry, sandy soil, fields and roadsides.

Eragrostis sporoboloides Smith (Poa hirsuta Michx).—Selma, Ala.; Augusta, Ga.; Aiken, S. C.; Norfolk, Va., dry, sandy soil, usually in cultivated fields. Panicles sometimes 3 feet long. A perfectly distinct species.

Eatonia dudleyi Vasey.—Knoxville, and in Polk County, Tenn., dry, fertile, wooded hillsides.

Uniola gracilis Michx.—Mobile, Ala.; Tallahassee and Jacksonville, Fla.; Savannah, Ga.; Wilmington, N. C.; Norfolk, Va., usually in low, moist woods.

Uniola latifolia Michx.—Knoxville, Tenn., in rich soil, bluffs of Tennessee River. Not in flower.

Uniola longifolia Scribn.—Mobile, Ala., dry, fertile woods, summit of a low hill. Grew with *Uniola gracilis* and appeared very distinct. Is larger and coarser, more erect, and has a duller green color, while the hairy sheaths distinguish it at once.

Uniola paniculata L.—St. Georges Island, Florida, on the outer beach, between an undergrowth of sabal, etc., and tide mark; in large patches, most of the plants sterile. Takes the place on the coast of the Southern States of *Ammophila arenaria*, which it resembles in habit of growth, especially of the underground parts.

Distichlis maritima Raf.—Apalachicola, Fla., in salt marshes along the coast. Not in flower.

Poa compressa L.—Polk County, Tenn.: Norfolk, Va., dry soil, roadsides, etc.

Poa pratensis L.—Augusta, Ga.; Aiken, S. C., shaded ground at roadsides.

Festuca elatior pratensis Hack.—Norfolk, Va., roadsides.

Festuca Myurus L.—Norfolk, Va., roadsides.

Festuca nutans Willd.—Hiwassee Gorge, Polk County, Tenn., shaded ground.

Bromus ciliatus purgans A. Gray.—Knoxville, Tenn., fertile soil, wooded bluffs, on Tennessee River.

Bromus secalinus L.—Polk County, Tenn., along railway track.

Bromus unioloides HBK.—Mobile, Ala., about wharves; small specimens.

HORDEÆ.

Elymus canadensis L.—Hiwassee Gorge, Polk County, Tenn., on a shaded ledge of rock.

Elymus virginicus L.—Augusta, Ga., Aiken, S. C.; Norfolk, Va., along streams and ditches and in swamps.

BAMBUSEÆ.

Arundinaria macrosperma Michx.—Selma and Mobile, Ala.; Augusta, Ga.; Aiken, S. C., forming "canebrakes" on river banks and in swamps.

Arundinaria tecta Muhl.—Mobile, Ala., rich, moist soil, border of a pine-barren pool.

BULLETIN NO. 2.

U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF AGROSTOLOGY.

FODDER AND FORAGE PLANTS,

EXCLUSIVE OF THE GRASSES.

BY

JARED G. SMITH,

Assistant Agrostologist.

WASHINGTON:

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF AGROSTOLOGY,
Washington, D. C., June 18, 1896.

SIR: I submit herewith for publication as a bulletin of this division, a descriptive list of fodder and forage plants, exclusive of grasses. The arrangement of the different kinds is alphabetical, according to the initial letter of their scientific or Latin names. There is added an alphabetical list of all the common or English names applied to these plants, with their Latin equivalents. The work is popular in its character, and is as free from technicalities as possible. The descriptions are brief, and the remarks under each species, while brief, include what has been regarded as most important, and afford such information as the farmer and others interested would be most likely to wish to know. Besides the cultivated forage plants which are already more or less widely known, native species which have never yet been cultivated are included in the enumeration. There are in the United States over 200 native or wild species of this class which are recognized locally as excellent forage plants. More attention should be given these natives, for there is every reason to believe that among them are many kinds fully equal in productiveness and feeding value to any of those now under cultivation, and possibly many superior to anything we have now in their adaptability to certain soils or climates or in their value for special uses. Among the species particularly worthy of attention in this connection are wild vetch (*Hosackia*), Beckwith's clover, buffalo pea, winter fat, prickly pear, sotol, and deer weed.

Respectfully,

F. LAMSON-SCRIBNER,
Chief of Division of Agrostology.

Hon. CHAS. W. DARNEY, JR.,
Assistant Secretary of Agriculture.

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FODDER AND FORAGE PLANTS.

Achillea millefolium. Yarrow; Milfoil.

A perennial composite with simple stems, twice pinnately parted leaves, and white or pink flat-topped flower-clusters. Common in old fields and meadows throughout the eastern United States and extending westward through the prairie region. In this country it is usually considered a weed; but in Europe, and especially in England, is held to be a very valuable addition to sheep pastures.

FIG. 1.—Gunaninpil (*Allionia incarnata*).

FIG. 2.—Tumbleweed (*Amaranthus blitoides*).

Adenostoma sparsifolium. Deer brush.

This rosaceous shrub and the closely related *A. fasciculatum* form an important part of the chaparral from the San Bernardino Mountains southward into Lower California. Stock feed upon them in winter and at other times when grass is scarce.

Allionia incarnata. Gunaninpil. (Fig. 1.)

A slender prostrate plant belonging to the Four O'clock family, which comes up from the seed after the summer rains in the grazing region of Arizona and New Mexico, and furnishes a palatable and nutritious food for sheep and cattle. It stands pasturing well, and usually ripens an abundance of seed.

Amaranthus. Bigweed; Pigweed; Tumbleweed. (Fig. 2.)

On the western ranges there are several species of Amaranthus which contribute to the forage. One of these, *A. blitoides*, comes up on new breaking, and with other weedy species is readily eaten by cattle before it has become woody. Because of their tumbling habit, they are rapidly scattered by the winds.

Amphicarpæa monoica. Hog peanut.

A wild bean, native of the woodlands and forests throughout the region east of the Missouri River, with two kinds of flowers; conspicuous ones borne on the upper portions of the plant which seldom ripen seed and inconspicuous fertile ones borne on slender stalks near the surface of the ground. The latter form fleshy subterranean pods, somewhat like those of the peanut. It is eaten greedily by all kinds of stock, and adds materially to the value of woodland pastures. The underground fruits furnish some food for swine.

FIG. 3.—Kidney vetch (*Anthyllis vulneraria*).

FIG. 4.—Peanut (*Arachis hypogæa*).

Anthyllis vulneraria. Kidney vetch; Common kidney vetch; Wound wort; Wound clover; Sand clover; Yellow sand trefoil; Lady's fingers. (Fig. 3.)

A low perennial legume, which is found wild over a large part of Europe. It grows naturally in very dry and sterile soils along the roadsides wherever the soil is thin and the subsoil calcareous. It is recommended as furnishing a palatable though scant forage on dry, calcareous soils in places that are too poor to support even white clover. The product of the first year is small, so that it is only a profitable crop when sown with grain. The second year the plants throw up tall stems, often 3 or 4 feet high. It is not recommended to sow this crop in the United States, except experimentally upon such barren soils as have been described, and then only after the better species have been tried and found to be failures.

Apios tuberosa. Ground nut.

A wild climbing bean, with milky juice and straight or slightly curved many-seeded pods, growing in low grounds, as far west as the Missouri River. It is eaten by all kinds of stock. The edible tubers, which furnish food for swine, are borne on underground shoots.

Arachis hypogæa. Spanish peanut; Peanut; Ground nut; Goober; Earth nut. (Fig. 4.)

An annual herb, a native of Peru and Brazil, introduced very widely in cultivation throughout the Southern States. The peanut is hardy as far north as Maryland. This is one of the most valuable fodder plants for the Southern States. There are two varieties—the one which furnishes the peanut of commerce, which requires a long season; and the Spanish peanut, which matures in about three months. The pods of the latter are smaller, and the seeds fewer and smaller,

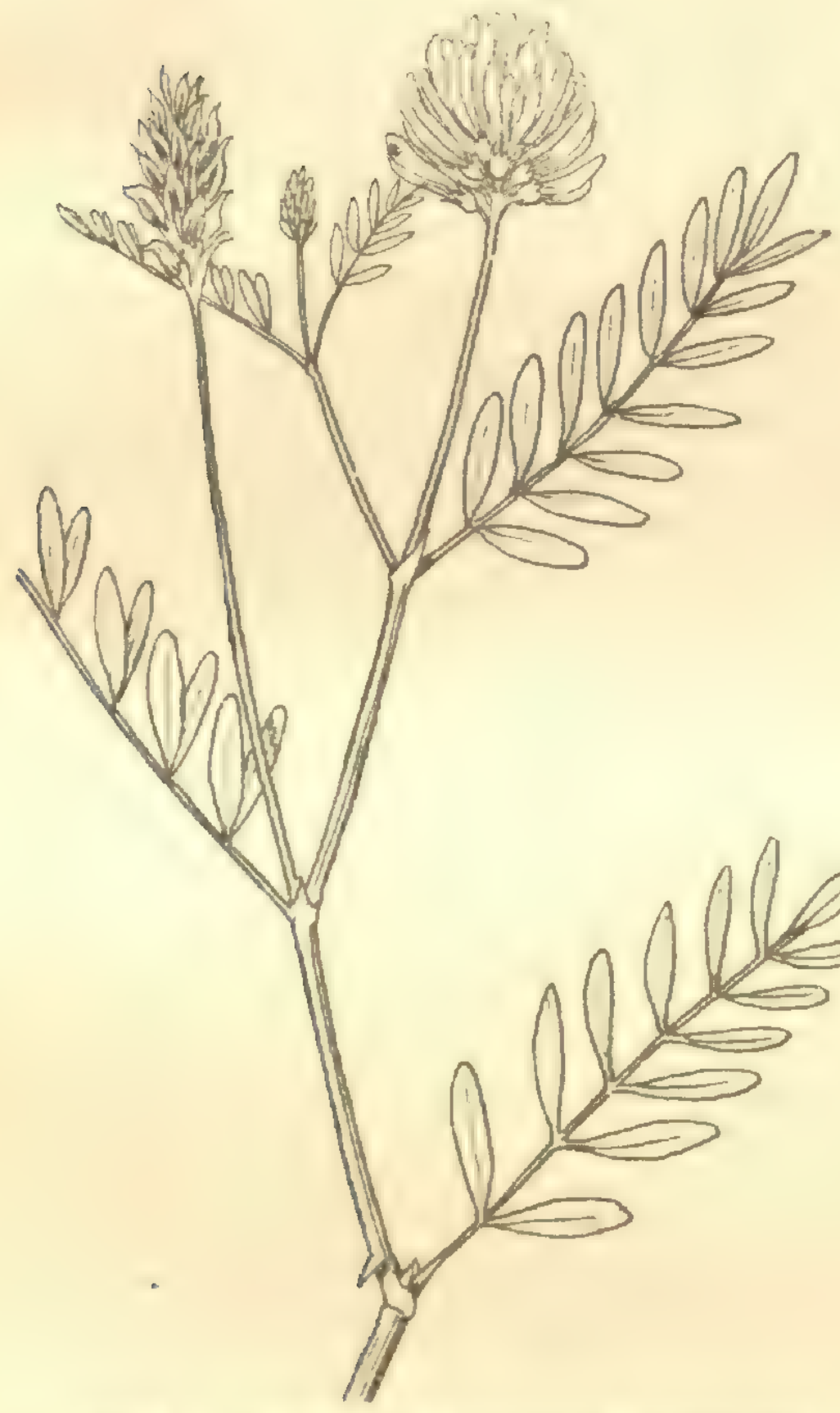

FIG. 5.—Buffalo pea (*Astragalus adsurgens*).

FIG. 6.—Australian saltbush (*Atriplex leptocarpum*).

than those of the edible variety. Peanut-vine hay is more nutritious than that of red clover. The yield of nuts ranges from 50 to 75 bushels to the acre. The Spanish peanut is the one usually grown for forage. The vines are pulled when the pods are about half formed, and are converted into hay by a method similar to that used in the treatment of cowpeas. The nuts or beans are rich in oil and albuminoids. Peanut meal makes a richer stock food than cotton-seed meal. A valuable oil can be expressed from the seeds.

Astragalus. Buffalo pea; Rattle pod. (Fig. 5.)

Herbaceous perennials, with pinnate leaves and usually conspicuous bean-like flowers, the pods becoming inflated when ripe. This genus is one of which there are about 100 American species distributed throughout the United States, the greatest number occurring in the prairie and Rocky Mountain regions. Some of the

species are, from their wide distribution and number of individuals, of great value on the native pastures of the West. Perhaps the most important of these are: *A. hypoglottis*, rattle pod; *A. caryocarpus*, the buffalo pea and buffalo clover of the plainsman; *A. canadensis*, Canada milk vetch; and *A. adsurgens*. The buffalo pea has fleshy pods, which are produced in enormous quantities in the early spring. They are eaten by cattle and horses, and are nutritious. The pods have also been used as a vegetable. Besides these innocuous species, the genus contains a number which have attained wide notoriety as loco weeds, poisonous to stock, the worst and most widely distributed one being *A. mollissimus*. Many of the species are worthy of cultivation.

Atriplex canescens. Shad scale. (Fig. 7.)

A perennial shrub of the Pigweed or Saltbush family, often attaining a height of 10 feet, native in the higher valleys and mesas or table-lands of New Mexico and Arizona. The leaves and small twigs are eaten by cattle, which grow fat upon them, but are said to give a bad taste to milk. It is the principal forage plant of a wide range of territory in the Southwest, and deserves to be more widely distributed and brought into cultivation, especially on saline or alkaline soils.

FIG. 7.—Shad scale (*Atriplex canescens*.)

Atriplex confertifolium. White sage; Shad scale.

A native saltbush, growing on the high plains of Nevada and Utah, where it furnishes a considerable part of the winter forage. It grows on alkali spots, and is worthy of cultivation in attempts to reclaim lands which are too strongly alkaline to produce better forage plants.

Atriplex leptocarpum. Slender-fruited saltbush; No. 2 Saltbush. (Fig. 6.)

An Australian saltbush, which is being introduced into this country for the same purposes as *A. semibaccatum*. It is a diffusely branching slender annual, and produces seed in enormous quantities. It will undoubtedly make a valuable addition to the forage plants adapted to the grazing regions of the West, and is reputed to withstand much drought.

Atriplex semibaccatum: Australian saltbush; Saltbush. (Fig. 8.)

A procumbent or prostrate much-branched slender perennial, with herbaceous stems spreading 1 to 4 feet in every direction. This species of Australian saltbush has become widely known within the last ten years, it being one of the best crops that can be grown for the reclamation of alkali land in California and the Southwest. It is a native of the Darling and Lachlan River valleys in New South Wales. Experiments conducted by the California Experiment Station have warranted the conclusion that the growth of the plant is vastly better on alkali soils than on ordinary dry soils. The saltbush takes up from the soil, when it is grown where there is an excess of alkalies, enormous quantities of these deleterious salts, so that the ashes often amount to one-fifth of the total weight of dry forage. The amount of crude protein in saltbush is nearly as great

as in alfalfa. It is an excellent forage plant for soiling sheep, though the nutritive ratio is such that it needs to be fed with hay or other coarse fodder in order to obtain the best results. Saltbush contains a bitter principle which acts as a tonic. It is probably the best plant for growing on alkali spots, especially if the crop is removed from the ground each year. Every ton of green forage so removed contains about 110 pounds of mineral ingredients, of which the soda salts form a very large percentage. Saltbush is not so well adapted to those portions of the West where the winters are severe, in such localities being an annual and requiring fresh seeding each season. The seed may be obtained at fair prices in the California markets.

Atriplex vescicarium. Bladder saltbush.

An Australian species, which Baron von Mueller considers one of the most valuable forage plants of that country, because of its abundance on the arid plains of the interior and the facility with which it disseminates itself. It withstands the utmost extremes of drought. It was introduced into Europe a number of years ago, and is now extensively planted throughout the delta of the Rhone, where it is of great value for sheep. It is a woody species, which is easily multiplied from both cuttings and seed.

FIG. 8.—Australian saltbush (*Atriplex semibaccatum*).

Bœhmeria nivea. Ramie; Cloth plant; China grass plant; Ramie grass.

This well-known fiber plant, which has been introduced rather widely throughout the United States in the last twenty years, furnishes a large amount of forage of fair quality. It is eaten well by all kinds of stock; so that wherever this plant is grown for its fiber it is well to remember that it will also furnish valuble feed.

Brassica napus. Winter rape; Rape; Dwarf Essex rape.

A succulent and nutritious forage plant, closely related to the Swede turnips. It is adapted to deep, rich, and warm loams and sandy soils. It has been widely cultivated in the northern United States and Canada, and succeeds on any rich and well-drained soil, provided the summers are not too hot and dry. If the ground is in good condition and free from weeds, it may be sown broadcast at the rate of 3 to 5 pounds of seed per acre. If the land is wet, however, rape should be sown in raised drills, when 1 or 2 pounds will be sufficient. The time for sowing the seed will vary with the object sought, and the climate. For soiling purposes it may be sown in May in the States bordering on Canada, and cut or eaten off when it is sufficiently advanced. It will grow up again and may be used a second time in the same manner, but ordinarily the best results are obtained

when it is sown during the latter part of June or the first half of July. When put in earlier, the hot suns of August seem to hasten its maturity, and the yield is not satisfactory. If sown in drills, it should be cultivated as long as a horse can be driven between the rows. Sheep may be pastured upon a field of rape by cutting it up into small pens by means of movable hurdles, so that different parts of the field may be depastured in rotation. Cattle should not be turned into a field, because they will trample and destroy much more than they eat. Rape fed to cows increases the flow of milk, and there is less danger of the milk being tainted than when turnips or turnip tops are fed. There is considerable danger in turning hungry sheep or cattle into a field, because of a liability to bloat. It is also a good rule never to turn animals into a field in the early morning.

Brassica oleracea. Cabbage.

An annual or biennial plant, indigenous to various parts of Europe, and widely cultivated as a vegetable throughout the world. Cabbage is largely grown in some parts of Europe as a crop for soiling either sheep or cattle, and as a stable food in late autumn it is far superior to turnips. It has been estimated that the crude protein of an acre of cabbage amounts to about 1,500 pounds—an enormous yield compared with that of alfalfa or red clover.

FIG. 9.—Sedge (*Carex retrorsa*).

Carex aristata. Giant sedge.

A perennial sedge, with stout running rootstocks and leafy stems 2 to 3½ feet high. This is one of the most important forage plants of the Upper Missouri prairies, as it forms a large part of the growth in moist, boggy places in the regions where it occurs, and furnishes a large amount of early pasturage and hay. The hay contains over 11 per cent of crude protein.

Carex jamesii.

A sedge which is abundant in the moist meadows of northern Utah, where it occasionally occupies the ground to the exclusion of other species. It is pastured or mowed, and produces a poor quality of hay.

Carex muricata. Water grass.

A sedge, native of Arizona and New Mexico; very abundant in low places on the mesas. It contributes a large part of the hay cut from wet meadows, and is eaten well by stock.

Carex retrorsa. Late-fruited sedge. (Fig. 9.)

A stout, erect, tufted, leafy sedge, 1½ to 3 feet high, growing in wet, boggy places in the lake region of Minnesota and the Dakotas. It is very tender and juicy, and is readily eaten by stock. It is seldom cut for hay, because of its growing in places too wet to be mowed, but it is an important factor in the natural forage of the region. Analyses show that it contains nearly 16 per cent crude protein. This is one of the species which is deserving of cultivation.

Carex siccata. Silver-topped sedge.

A perennial sedge, spreading extensively by means of creeping rootstocks, with clustered erect stems 1 to 2 feet high, and erect, narrow, pointed leaves, shorter than the stems. Common on dry bottoms and in swales in the Upper Missouri prairie region. It may be distinguished by its silvery brown heads and by its habit of

forming extensive mats of turf. This is a very valuable species, as the hay contains nearly 15 per cent of crude protein.

Carex stenophylla. Dwarf sedge.

A low sedge, growing in moist prairies thoughout the Upper Mississippi and Missouri region. Analyses of this sedge show that it contains about 14 per cent of crude protein.

Carex straminea. Straw-colored sedge.

A perennial sedge, with erect, slender, clustered stems 1 to 3 feet high, and narrow stiff leaves, shorter than or as long as the stems. Common in the Mississippi Valley in dry prairies and moist meadows. It contributes a large amount of forage in the localities where common. The hay contains about 8 per cent of crude protein.

Carex stricta. Upright sedge.

A slender tufted perennial sedge, forming large bunches 6 inches to 3 feet high. The leaves are long and narrow, sharp pointed, and roughened on the margins. Common in low, wet meadows and along the margins of ponds and lakes throughout the prairie region. The hay contains 11 per cent of crude protein.

Carex sychnocephala. Narrow-fruited sedge.

A slender, erect, perennial sedge, growing in large tufts 6 to 18 inches high, with narrow, long-pointed leaves, longer than the stems, rare in boggy places along streams and lakes in the Upper Missouri prairie region. In localities where it occurs it adds considerable value to the early pastures. The hay contains 9 per cent of crude protein.

Carex vulpinoidea. Fox sedge.

A perennial sedge, common throughout the prairie region of the West, with stiff, sharply three-angled stems 1 to 2½ feet high, and flattish, long-pointed leaves, longer than the stems. It grows in large bunches, and prefers low prairies and rather dry swales. It is readily eaten by stock. Analyses show that hay of this species contains over 10 per cent crude protein.

Centrosema virginianum. Spurred butterfly pea.

A twining perennial bean, with trifoliate leaves and large, showy violet flowers an inch long. The pods are 4 to 5 inches long, many-seeded, linear, flat, thickened at the edges, and marked with a raised line on each side next the margin. Common in sandy woods in the Southern States, extending into tropical America. It furnishes a large amount of valuable forage in woodland pastures, and is worthy of cultivation.

Ceratonia siliqua. Carob tree; St. John's bread; Carob bean.

A leguminous tree, often attaining a height of 50 feet, indigenous to the eastern Mediterranean region, but introduced somewhat widely through the Southern States and in California. Its saccharine pods are very valuable as a food for stock, and are sometimes used as human food. The fruit is abundantly produced, even in arid regions and in seasons of drought. The pods contain about 66 per cent of sugar and gum, and are fed in rations of about 6 pounds per day, crushed or ground.

Chenopodium. Pigweed; Goosefoot; Lamb's-quarters. (Fig. 10.)

There are a large number of native and introduced species in the United States, all of which are eaten by cattle and sheep, contributing much valuable forage when young. They are adapted to arid and barren lands, as well as to cultivated fields, and should be included in the list of forage plants adapted to the grazing regions of the West.

Cicer arietinum. Chick pea; Ram's horn; Gram; Coffee pea. (Fig. 11.)

An annual legume, native of Armenia, which has been cultivated as cattle food and as an article of human diet for over three thousand years. Next to the cereals, it forms the largest part of the food used in Spain, India, and portions of Africa. The seeds are ground into meal, and used in the same manner as cotton-seed meal for fattening animals. The leaves are covered with a clammy exudation, consisting largely of oxalic acid, so that the plant itself is unsuited for forage, but it is often used as a soil renovator. The yield of seed is sometimes very large—upward of 100 bushels to the acre. The crop ripens in about four months.

FIG. 10.—Pigweed (*Chenopodium leptophyllum*).

FIG. 11.—Gram (*Cicer arietinum*).

Cichorium endivium. Endive.

This culinary vegetable is particularly adapted as a pasture plant for extremely arid regions, as it matures seed which will germinate in the hottest deserts of central Australia. (Von Mueller.)

Cichorium intybus. Chicory.

A well-known perennial, indigenous to Europe and northern Asia, where it is found growing wild along roadsides and in old fields. It is a good fodder plant, especially for sheep, and can be kept growing for several years if it is cut before flowering. The roots are much used as a substitute for coffee.

Clitoria mariana. Butterfly pea.

A low ascending or twining legume with pinnately trifoliate leaves and pale-blue flowers 2 inches long. It grows on dry hills and banks of streams in the Eastern and Southern States. A nutritious forage plant for woodland pastures, but usually too scattering to be of much value.

Convolvulus edulis. Sweet potato.

The tubers are used in many parts of the Southern States as food for cattle, and the vines are cured on racks like cowpeas, and used for hay.

Crotalaria juncea. Sunn; Sunn hemp.

A fiber plant, indigenous to southern Asia. It is cultivated in India to feed milch cows, and is suited for cultivation in the warmest portions of the United States. In rich, friable soil, under favorable circumstances, it often grows to a height of 10 feet.

Cyperus erythrorhizos. Chestnut-colored sedge.

An annual sedge with upright stems from 6 inches to 2½ feet high, leafy at the base, and with four or five leaves clustered about the inflorescence at the top. The flower clusters are usually bright chestnut-brown. Widely distributed over the prairie region, where it grows in rich, moist meadows. The hay contains over 10 per cent of crude protein, and while this sedge is not abundant, it adds no little value to native pastures and wet meadows.

Cyperus esculentus. Chufas; Hognut; Ground almond. (Fig. 12.)

A perennial sedge, spreading extensively by underground stolons, which produce enormous numbers of edible tubers. In rich, sandy loams it is often cultivated as a food for hogs, which are turned into the field in autumn to root up the nuts. The tubers contain from 17 to 28 per cent of oil, 27 to 29 per cent of starch, and 12 to 21 per cent of gum and sugar. This sedge is important for cultivation in desert regions. The oil extracted from the nuts is said to surpass in excellence all other oils used for culinary purposes.

Fig. 12.—Chufas (*Cyperus esculentus*).

Cyperus strigosus. Tule; Tula grass.

A tall sedge with the stems 4 to 6 feet high, growing in marshy places in California and Arizona. It is much relished when young by all kinds of stock.

Cytisus proliferus albus. Tagasaste.

A shrubby perennial legume with silvery gray leaves, native of the Canary Islands, which has been recommended for cultivation as a forage plant in hot and dry regions. It will perhaps prove of some value in the arid Southwest. The seeds, which are slow in germination, should be boiled four or five minutes, or soaked in water for twenty-four hours before planting. The plants should be kept one year in the seed bed and then transplanted to rows 6 to 8 feet apart in the field where they are to remain, and cultivated until they are 2 or 3 feet high. At the end of about the third year cattle or sheep may be turned into the field, and the crop will require no further attention except to occasionally cut back the shrubs to prevent their growing too high. The leaves and twigs are very nutritious, both cattle and sheep fattening rapidly upon them. This plant should be given a thorough trial in the southwestern portions of the United States, for when once firmly established the tagasaste plants will withstand any amount of drought.

Dalea scoparia. (Fig. 13.)

A wild vetch, with gray, almost leafless, stems; abundant on the mesas of New Mexico and Arizona, where it furnishes almost the only forage in the dry season. It is worthy of cultivation.

Dasylirion texanum. Sotol.

A fodder plant of the lily family, which occurs throughout western Texas and northern Mexico. It grows abundantly in the great bend of the Rio Grande, and is there highly esteemed, producing fodder for sheep in the winter season and during periods of extreme drought. The appearance of the plant is something like

FIG. 13.—*Dalea scoparia*.

FIG. 14.—Beggar weed (*Desmodium tortuosum*).

that of a large pineapple growing on a trunk 2 to 5 feet high. The narrow leaves, 3 to 4 feet long, and one-third to one half inch wide, radiate in every direction, forming a rosette at the top of the trunk. The portion eaten is the inner cabbage-like heart, which remains after the spiny leaves have been cut off. An analysis of this, made by the chemist of the Department of Agriculture, shows that it contains about 12 per cent of sugar and gum, and about 3 per cent of crude protein, besides 65 per cent of water. No attempt has been made to cultivate sotol, and it is becoming exterminated in many portions of its range. Sheep can exist upon it four or five months in the winter without access to water, so that it would be an excellent forage plant for dissemination and cultivation in arid regions where the winters are not too severe.

Desmanthus brachylobus.

An erect perennial legume 1 to 4 feet high, with twice pinnate leaves, and sickle-shaped pods 1 inch long, borne in a dense globular cluster. Common on bottom lands and alluvial banks from Minnesota to Kentucky, Florida, and Texas. It is much relished by horses and other stock, and should be given a trial in cultivation.

Desmodium acuminatum.

A valuable forage plant, growing in rich woods from Canada to the Gulf. The leaves are crowded at the summit of the stem, from which arises the elongated naked raceme.

Desmodium canadense.

A tick trefoil with hairy stems 3 to 6 feet high, and oblong lanceolate, obtuse leaflets longer than the petiole. In rich, dry woods from New Brunswick to Minnesota and Kansas. A species deserving of trial under cultivation.

Desmodium nudiflorum.

Common in dry woods throughout the Eastern and Southern States. The leaves are all crowded at the summit of the sterile stems, the elongated raceme springing directly from the roots. This tick trefoil furnishes considerable forage in woodland pastures.

Desmodium pauciflorum.

A perennial woodland tick trefoil with leaves scattered along the low ascending stems, 8 to 15 inches high, the inflorescence few-flowered and terminal. Common in woods from Canada to Kansas and southward, and valuable as a forage plant for shady pastures.

Desmodium tortuosum (*D. molle*). Beggar weed; Florida beggar weed; Cockshead; Florida clover; Tick trefoil; West Indian honeysuckle. (Fig. 14.)

An annual leguminous plant, indigenous to Florida and the Gulf States, extending into the West Indies and tropical America. This is undoubtedly one of the very best forage plants for those portions of the United States where it grows. The stems are tall, and, if grown at considerable intervals, are woody, but where seed is scattered thickly over the ground the entire plant can be converted into hay or ensilage. Florida beggar weed springs up naturally in fields wherever the ground has been disturbed, about the middle of June, and matures a crop in seventy-two to eighty days. On sterile clay soils in the vicinity of Washington, D. C., beggar weed grows 3 to 4 feet high. In the rich, moist, sandy fields along the Gulf of Mexico it grows from 6 to 10 feet high. Horses, cattle, and mules are very fond of it. Beggar-weed hay contains about 21 per cent of crude protein. At a yield of 10 tons, the amount of fertilizers contained in a crop yielded by one acre has been estimated at: Potash 80 pounds; phosphoric acid, 160 pounds, and ammonia, 400 pounds. It will be seen from this that as a renovator of worn soils, or as a green manure, no better or cheaper fertilizer can be added to a field than to turn under a rank growth of beggar weed. The tap root descends deeply into the soil, bringing up mineral fertilizers from the subsoil, which can be utilized by other crops. Beggar weed can be sown after a crop of oats has been harvested, or it can be scattered between corn rows after the crop has been laid by. Six to ten pounds of clean seed are enough for an acre. If beggar weed is tried as a crop in the North, it should not be planted until midsummer. If planted early, the seed will lie in the ground and will fail to germinate until the ground has become warm. Clean seed can be procured in the markets at about $15 per bushel of 60 pounds. Beggar weed makes an excellent quality of ensilage, either alone or mixed with corn fodder.

Desmodium triflorum.

A densely matted perennial herb, occurring in tropical regions of Asia, Africa, and America. Roxburgh states that it helps to form the most beautiful turf in India, and that cattle are very fond of it. It springs up in all soils and situations, furnishing an excellent fodder in places too hot for ordinary clover. It deserves

trial in the warmest portions of the Southern States. There are many other species of Desmodium in the eastern and southern United States, some occurring in woodlands, and others found only in open prairies. All are eaten with avidity by stock, and all are worthy of an extended trial in cultivation, although on account of their jointed pods covered with minute hooked hairs they are perhaps liable to become weeds. The foliage produced by them is exceedingly nutritious, and because they are strong growers they would have some value in reclaiming worn lands.

Dioscorea batatas. Chinese yam; Yam.

A rank-growing vine cultivated in all tropical countries for its edible roots. It is propagated by means of aerial tubers which form in the axils of the leaves. This has been introduced into tropical Florida. The fleshy, mucilaginous roots serve as food for man, and are readily eaten by all kinds of stock.

Dolichos multiflorus. Velvet bean; Banana field pea; Banana stock pea.

A rank-growing vine with plump, velvety pods, each containing 3 or 4 large oval beans. An ornamental, which promises to become a valuable forage plant on sterile, sandy soils in the South. In Florida it has yielded at the rate of 16,680 pounds of green forage per acre. It is there esteemed as a winter mulch, as, when killed by frost, the leaves remain on the vines over winter.

Eleocharis obtusa. Tufted spike rush.

A tufted annual spike rush with leafless stems 8 to 18 inches high. It grows in shallow ponds and marshes in the Upper Missouri prairie region, and furnishes a fair quality of forage in localities too wet for grasses and sedges. The hay contains 10 per cent crude protein.

Eleocharis palustris. Common spike rush.

A spike rush with slender, cylindrical, upright tufted stems, 1 to 4 feet high, from perennial roots and running rootstocks. Very common in shallow water or in wet meadows from Lake Champlain along the Great Lakes to Minnesota and northward. The leafless stems yield a considerable amount of early pasturage in wet meadows. The hay contains 9½ per cent of crude protein.

Erigeron canadensis. Horseweed; Butterweed; Fireweed.

A bristly, hairy, erect, wand-like, annual composite, with numerous linear, mostly entire, leaves, and very numerous heads of small, dirty white flowers. A cosmopolitan weed growing in waste lands, fence corners, and along roadsides. This species has been reported valuable as sheep fodder in the arid regions of New Mexico and Arizona.

Erodium cicutarium. Alfilaria; Storksbill; Pin clover; Pin grass; Pinweed; Filaria; Filaree; Alfilarilla. (Fig. 15.)

This weedy annual has nearly as large a distribution as the following species, but is of less value. This species has been regarded by agricultural writers as the true *Alfilaria*, but according to Professor Greene its occurrence is rare compared with that of *E. moschatum*, and its foliage is more fragrant and less readily eaten by stock.

Erodium moschatum. Cranesbill; Alfilaria, Storksbill; Pin clover; Pin grass; Pinweed; Filaria; Filaree; Alfilarilla.

An annual of the Geranium family which occurs abundantly, and is of much value in pastures over a large extent of territory on the Pacific Slope. Elsewhere in the United States it is sparingly introduced, and usually regarded only as a weed,

though not troublesome. It springs up during the wet season from January to June, and grows on all kinds of soils from the coast up to the snow line. It is an excellent pasture plant, but seldom reaches a sufficient height to be mowed for hay. It is eaten by all kinds of stock as long as it is green, but when dry is of little value because the stems are brittle and break up into small fragments. It is cultivated to some extent, and has been recommended for sowing in pasture lands in the Southern States. A related species, *E. cygnorum*, native of Australia, is considered one of the best forage plants of the drier regions of that continent.

Ervum lens. Lentil; Winter lentil.

An annual legume, native to and widely cultivated in Europe. The leafy stalks make good forage. Its seeds are palatable and nutritious as food for man and

FIG. 15.—Alfilarilla (*Erodium cicutarium*).

FIG. 16.—Winter fat or sweet sage (*Eurotia lanata*).

domestic animals. It is suited for cultivation in cold climates and in the mountains at high elevations. The seeds retain their vitality for about four years. The variety called the "winter lentil" is more prolific than the "summer lentil." In common with most other leguminous plants, a calcareous soil is essential for its prolific growth.

Eurotia lanata. Winter fat; White sage; Sweet sage. (Fig. 16.)

A perennial half-shrubby plant growing a foot or two high, abundant throughout the Rocky Mountain region from British Columbia to Mexico. Its slender woolly twigs bear narrow leaves an inch and a half long, with velvety grayish surfaces, and with the margins rolled back. The flowers are minute, in small clusters in the axils of the leaves, chiefly on the upper parts of the stem. In western Texas and in the more arid regions of Arizona, Nevada, and Utah this

plant is very highly valued for winter forage. An important fact in regard to the plant is its ability to thrive in alkali soils. It contains a bitter principle, which is sometimes employed as a remedy for intermittent fevers. Sheep and cattle grazed on lands where winter fat grows, increase in weight rapidly, and are said to be remarkably free from disease. It is worthy of trial, and should be introduced into the pastures of all arid and semi-arid or alkaline grazing regions.

Faba vulgaris. Horse bean; Broad bean; Common field bean; Straight bean.

A coarse, erect, rank-growing annual of considerable value as a forage plant, grown in the eastern United States, and more extensively in Europe. The beans, which contain about 33 per cent of starch, are used for fattening cattle, but their use, if long continued without change or without proper admixture of other foods, often results in paralysis, on account of the bitter poisonous alkaloids which the seeds contain.

Fagopyrum esculentum. Buckwheat; Common buckwheat; Japanese buckwheat; Silver-hull buckwheat.

Buckwheat, the well-known annual cultivated for its seeds, is a native of northern Asia, and has been under cultivation about 1,000 years. It succeeds in cold climates on the poorest land. For fodder or as green manure, clayey soils produce the largest crops. On account of the short season in which it matures, it is adapted to cultivation in high latitudes and alpine regions. It is an excellent soiling crop, either fed alone or with oats or green corn, and is recommended for soiling milch cows.

Franseria dumosa.

A shrubby plant related to the cocklebur, which is one of the most characteristic plants of the Colorado desert and the dry sandy plains of southern California. It is valuable feed for stock, either dry or green. It produces an abundance of burs, which are eaten by cattle and horses, and are as fattening as grain. It also makes a very fine feed for sheep. It dries up after the winter rains, but becomes green after every shower.

Galactia glabella. Smooth milk pea.

A low, prostrate or twining, perennial bean with nearly smooth stems, trifoliate leaves, and purple flowers in interrupted or nodding racemes. Common in sandy woods from New York to Florida and Mississippi. It makes an excellent summer forage for milch cows, and adds value to woodland pastures.

Galactia pilosa. Milk pea.

Like the last species, but with stems and leaves soft and downy. It is of some value as a summer forage in the eastern United States.

Galega officinalis. Goat's rue; Goat's clover.

A perennial legume, with erect, branching, leafy stems 1½ to 2 feet high, pinnate leaves, and purple flowers borne on a long-stalked spike. A forage plant of value on account of its resistance to drought, which has been recommended for the northern prairies and central Rocky Mountain districts. It is usually fed green, as it makes a poor quality of hay, and is not readily eaten by stock until they have become accustomed to its taste. The air-dried hay contains 17 per cent of crude protein.

Genista scoparia. Scotch broom.

A shrubby, perennial legume, native of Scotland. The young growth is chiefly valued as a food for sheep and other animals in winter.

Gleditschia triacanthos. Honey locust.

A leguminous tree 30 to 60 feet high, native of the eastern United States. The pods are eaten by stock, and the young growth is browsed down by cattle.

Glycine hispida. Soja bean; Soy bean; Coffee bean. (Fig. 17.)

An erect annual legume, with hairy stems and leaves, which has been cultivated in China and Japan from remote antiquity. It was long grown in botanic gardens, but when the facts concerning its use as a human food by oriental nations came to light about twenty years ago, it was largely introduced into this country and Europe, where thorough trials of its forage and food value have been made. There are a large number of named varieties, which vary in the color of their seeds and the length of time which the plants require to come to maturity. The seed is planted at the rate of half a bushel to the acre, in drills 2½ to 3 feet apart, and cultivated about the same as Indian corn. In Virginia, soja beans are planted between the hills of corn, so that two crops are produced on the same field at the same time. The yields of seed are often enormous. Soja beans are fed to stock green, as silage, or as hay. The haulms are rather woody, and

FIG. 17.—Soja bean (*Glycine hispida*).

FIG. 18.—Sulla (*Hedysarum coronarium*).

do not make the best quality of hay, but as either ensilage or green forage they are unsurpassed. The hay contains from 14 to 15 per cent crude protein and 3 to 6 per cent of fat. The beans contain from 32 to 42 per cent protein, and from 12 to 21 per cent of fat in fresh material. When fed to milch cows, a ration of soja beans increases the yield of milk, improves the quantity of the butter, and causes the animal to gain rapidly in weight. It is an excellent addition to a ration for fattening cattle. In China and Japan, where the soja bean is an article of diet, substances similar to butter, oil, and cheese, as well as a variety of dishes, are prepared from it. The yield of green forage amounts to from 6 to 8 tons per acre, and of the beans from 40 to 100 bushels. The feeding value of the bean has been found to be greater than that of any other known forage plant except the peanut.

Hedysarum coronarium. Sulla; Spanish sanfoin; French honeysuckle; Soola clover; Maltese clover; Honeysuckle. (Fig. 18.)

This perennial legume is a native of southern Italy, and was first introduced into cultivation in 1766. It grows best on sandy or clayey soils which are well

drained, or which have the ground water from 6 to 10 feet below the surface. It will withstand slight frosts, but is killed if the roots are frozen. It is a perennial in southern Italy, Sicily, and Algeria, but must be resown each year in northern Italy, where the winters are more severe. It has not as yet been largely introduced into this country, but deserves to be given a trial in Florida and the Gulf States. The practice is to sow the seeds in September or October, on land that has been deeply plowed and thoroughly pulverized, either alone or with winter oats or wheat. After the latter has been taken off the field, a crop of sulla 4 to 6 feet high springs up and is ready to cut from the latter part of May to July. In feeding value it compares very favorably with either red clover or alfalfa, and is better adapted to tropical or subtropical climates, provided seed is sown on well-drained and well-prepared land. If the seed bed is only given a shallow cultivation in preparation for sowing, it will require a full year before one crop can be taken from the land. The same precautions are necessary in using sulla as a soiling crop as with clover and alfalfa, to prevent loss of cattle through bloating.

Helianthus annuus. Sunflower.

The sunflower is a well-known annual weed, a native of Peru, which has become widely spread throughout the United States. Its leaves and heads make good green fodder for cattle and horses, and its oily seeds, which are produced at the rate of from 40 to 50 bushels to the acre, furnish an oil cake which is a valuable stable food. Six pounds are required to seed an acre. It is said to endure the excessive summer heat of central Australia better than any other cultivated herb that has been tried there, and deserves to be regarded as other than a useless weed in our own arid and semi-arid grazing and pastoral districts.

Helianthus tuberosus. Artichoke.

The artichoke is a native of North and South America, and has been cultivated in this country for fifty years or more for its edible tubers. Fed to milch cows, these tubers, which contain large amounts of sugar and gum, increase the flow of milk enormously. The leaves are also eaten by all kinds of stock. Artichokes are planted like potatoes, but greater distances apart, and the yield is from 200 to 500 bushels per acre. On rich and friable soils it yields spontaneously and uninterruptedly for several years without replanting. The tubers should be dug in autumn after the upper part of the plant has been killed by frosts, as at that time they contain the most sugar. It grows best in loams containing a high percentage of potash.

Hippocrepis comosa. Horse-shoe vetch.

This perennial fodder plant is quite widely cultivated in middle and southern Europe and northern Africa. It grows best on stony ground, especially on soils containing lime. It furnishes an early and very nutritious, though scant, forage, and is worthy of a trial on stony soils in the warmer portions of the United States.

Hoffmanseggia.

Leguminous shrubs or herbaceous perennials native of Texas and New Mexico, especially along the Rio Grande and its tributaries. The foliage is eaten by stock. Small, sweet tubers are produced by certain species, which in years of famine are eaten by the Mexicans and Indians.

Hosackia glabra. Deerweed.

This low bush or weedy herb grows on the mesas, and in the mountains and desert regions of southern California. It grows 2 or 3 feet high on the driest and most sterile soils, and is an excellent forage plant. It sometimes occurs in such abundance that it is cut for hay. As it ripens a large amount of seed each year, this is a promising species for trial under cultivation.

Hosackia purshiana (*Lotus americanus*). Wild vetch. (Fig. 19.)

An annual vetch widely distributed from Minnesota to Arkansas and west to the Pacific, in fields and open prairies. The erect branching stems are 6 to 18 inches high, the trifoliate leaves nearly sessile, smooth to silky haired, the flowers small, solitary, and inconspicuous, the pods narrow, flattened, six-seeded, and about an inch long. It is very common in the prairie region, especially along the Upper Missouri, and in some parts of California. It blooms all summer, and being readily eaten by all kinds of stock is on this account a valuable plant on the ranges, withstanding close pasturing and trampling, and reseeding itself freely, no matter how closely it may be eaten down. Cattle and sheep become

FIG. 19.—Wild vetch (*Hosackia purshiana*).

FIG. 20.—Black grass (*Juncus gerardi*).

"rolling fat" on pastures where this vetch abounds. It is one of the most promising native forage plants, and should be given an extended trial in cultivation, being particularly adapted to the drier soils.

Juncus gerardi. Black grass. (Fig. 20.)

A leafy rush with somewhat harsh, slightly flattened stems, 1 to 2 feet high, common in tidewater marshes along the Atlantic coast and extending westward through the region of the Great Lakes. It is the principal constituent of some of the marsh hay cut along the coast; it has a fair feeding value, and is important as a forage plant which will grow where better and more nutritious species can not.

Juncus nodosus. Big-headed bog rush.

A leafy, erect, smooth, stiff rush, 1 or 2 feet high, with very slender, creeping, tuber-bearing rootstocks. The leaves are slender and long-pointed. This rush is common in boggy places and wet meadows in the prairie region, and is of

some little value as early pasturage. Hay made of it contains 7 per cent crude protein. The plant becomes too coarse for forage during the summer months.

Juncus tenuis. Slender bog rush.

A slender, tufted, erect, wiry rush, 6 to 18 inches high, with leaves about 6 inches long. A common plant throughout the prairie region, occurring on the high prairies as well as on low ground. Though rather tough and wiry, it is readily eaten by stock. The amount of forage is small. Hay made of it contains about 7 per cent crude protein.

Lathyrus cicer. Winter flat pea.

A forage plant cultivated to some extent in Germany and Switzerland, and particularly valued because it becomes green earlier in spring than almost any other forage crop. The seeds are sown at the rate of 2 bushels to the acre. Its appearance is much like the more common flat pea. It reaches a height of 1 or 2 feet.

Lathyrus hirsutus. Winter vetch.

This vetch is one of the best that has been grown in the Southern States for winter forage. It is sown in September or October, so that it may germinate with the fall rains and become established before cold weather. It grows slowly until the ground freezes. By the first of January the roots are sufficiently developed so that the tops begin to grow rapidly, and by February the plants form a dense mat and continue to grow until hot weather. The plants bear grazing well, and stock of all kinds eat the dry hay. For the Gulf States this is one of the most valuable species of vetch for winter and early spring fodder. It reseeds itself freely. (Tracy.)

Lathyrus macrorhizos.

A native of western Asia which would be valuable for introduction into this country. It makes a good growth on the most barren woodlands, especially in mountain regions.

Lathyrus polymorphus. Everlasting pea.

A low pea, 6 to 12 inches high, with very large purple flowers, common on the prairies from Missouri and Nebraska westward. This furnishes considerable pasturage, and ought to be given a trial in cultivation.

Lathyrus pratensis. Meadow pea.

A prostrate perennial, native to and cultivated in the colder portions of Europe and Asia. The yield is quite large. It can be utilized for sheep pasturage, the bitter foliage not being relished by other stock. Suited for cultivation in alpine regions.

Lathyrus sativus. Bitter vetch.

A native of middle and southern Europe, which is adapted to cultivation in cold climates and alpine regions. The fodder is superior to that of vetches, but the yield is scant. In India it is grown as a winter crop, often on heavy, clayey soils which will grow no other legume. Great caution must be used in feeding the seeds of this plant, as they contain an alkaloid which is highly poisonous to domestic animals and to man. It has not been cultivated much in this country.

Lathyrus splendens. Pride of California.

This vine has been introduced into gardens because of its beautiful flowers. It grows wild in the mountains of southern California, and is said to be an excellent forage plant.

Lathyrus sylvestris wagneri. Flat pea. (Fig. 21.)

A perennial, native of eastern Europe and northern Asia, which has of recent years been highly recommended as a forage plant on account of its drought-resisting qualities. The plant looks much like the ornamental sweet pea, with many weak, leafy stems which interlace in great tangled masses. The handsome rose-colored flowers are borne in loose clusters, and are followed by pods not unlike those of the field pea. Analyses of the hay, made at the Michigan Station, showed 27 per cent crude protein. The growth of the plant at first is slow, and it is recommended to plant the seed in beds, from which they may be transplanted at the beginning of the second season to the place they are to occupy in the field. Several cuttings may be taken each season in favorable localities, and the average life of a field is from fifteen to twenty-five years. In this country the best results have been obtained with the flat pea in California, in the arid Southwest, and in the Southern States. The hay is relished by domestic stock of all kinds, and on account of its highly nutritious character it is of much value for soiling purposes. It is of especial importance as a forage plant for arid regions, provided the lands can be irrigated. When once fully established it holds the ground for many years. Its root system is somewhat similar to that

FIG. 21.—Flat pea (*Lathyrus sylvestris wagneri*).

of alfalfa, inasmuch as it will not thrive on lands which are undrained, or where the ground water stands within less than 10 or 15 feet from the surface. When once its roots have penetrated into the subsoil, the plant will withstand the hottest and driest summer. On rich soil the growth is often 4 or 5 feet high.

Lavatera assurgentifolia.

A shrubby, branching mallow 6 to 15 feet high, with hairy stems, long-stalked five to seven angled leaves 3 to 6 inches wide, and large rose-red and crimson flowers on long curving flower stalks which bend downward. A native of the islands off the coast of southern California which has long been cultivated as a forage plant around San Francisco. It has become established there on the sand dunes and along the seashore. The mucilaginous leaves are eaten by stock.

Lespedeza capitata. Round-headed bush clover.

A bush clover with rigid woolly stems, short leaf stalks, oblong leaflets which are smooth above and silky below, and flowers in rounded clusters. Common in dry

and sandy soil from New England to Florida and westward to the prairies. This is a good pasture plant, which deserves cultivation.

Lespedeza cyrtobotrya. Bush lespedeza; Japan bush clover.

A shrubby Japanese perennial fodder plant 6 to 10 feet high, which, although quite nutritious and containing about 16 per cent of crude protein, has not been considered worthy of further cultivation in the South. (Tracy.)

Lespedeza polystachya. Hairy bush clover.

An upright wand-like plant 2 to 4 feet high, growing on dry hills and barrens throughout the eastern United States, and valuable as a pasture plant.

Lespedeza procumbens. Creeping bush clover.

A slender trailing prostrate plant, common in dry, sandy soils throughout the eastern United States, and of some value as a pasture plant.

Lespedeza striata. Japan clover; Bush clover; Hoop-koop; King clover; Sherman's clover; King grass. (Fig. 22.)

An annual legume, native of China, which was accidentally introduced into South Carolina about thirty-five years ago, and has become naturalized throughout the Southern States as far west as Texas. Because of its many good qualities, it is the most highly esteemed of all forage plants for this region. It will grow on worn fields and sterile or exhausted soils, spreading rapidly over the surface, preventing further washing of the land. In such localities it grows prostrate on the surface, forming a dense mat of turf. In rich soils, especially such as are calcareous, it grows 20 or 30 inches high, and when mown, makes an excellent quality of hay, greedily eaten by all kinds of stock. It is distinctively a summer forage, appearing about the first of June, and dying down at the first touch of frost. In sandy soils it suffers greatly from hot weather. The acreage of meadow and pasture lands devoted to this clover is increasing rapidly. Its roots penetrate deeply into the soil, and in common with most other leguminous plants, Japan clover, by means of the tubercles on its roots, collects nitrogen from the air, so that because of its ready and rapid growth it is one of the best crops to turn under as green manure, and is one of the best for use in renovating old fields. The feeding value is high, though less than that of clover and cowpeas. Seed should be sown broadcast at the rate of half a bushel to the acre, either in autumn with oats or winter rye, or alone in spring.

Lespedeza violacea. Violet clover; Purple bush clover.

A bush clover with upright or spreading branching stems, whitish downy leaflets, purple flowers, and ovate pods. Common in the eastern United States, and contributing a small amount of forage in woodland pastures. There are many other species of native American bush clovers, which are hardy and nutritious, and which occur in considerable quantity in woodland pastures and open prairies. They all contribute to the native wild forage, and deserve a thorough trial in cultivation.

Liatris. Blazing star; Button snakeroot.

The blazing stars, of which there are about a dozen species, scattered throughout the prairie region, contribute a small amount of palatable forage when young, but are probably not of sufficient account to recommend them for cultivation, except as an addition to sheep pastures in the semi-arid West and Southwest.

Lotus corniculatus. Birdsfoot trefoil; Birdsfoot clover; Yellow trefoil; Sweet trefoil; Horned clover; Cat-in-clover.

A low, prostrate clover that will grow on the lightest and most sterile soils. It is an Old World plant, with a wide distribution, and has become extensively natu-

ralized in this country, especially in the South. Cattle and sheep are fond of it, and because of its deep roots it withstands drought, so that it is an excellent clover to sow in mixtures with taller-growing species in dry pastures. It is particularly valuable in such places because the herbage has a salty taste and is welcome in hay.

Lotus tetragonolobus. Square pod pea. (Fig. 23.)

A much-branched ascending annual, closely related to the birdsfoot clover. It is a native of southern Europe, and is there grown for salads and as an ornamental plant. It has been recommended by the California Experiment Station as the best winter crop for plowing under in spring as green manure. It yields from 20 to 25 tons of green fodder, equivalent to 4 or 5 tons of air-dried hay, and the roots are described as being fairly incrusted with tubercles, whose office it is to extract nitrogen from the air; and though the plant does not contain as high a percentage

FIG. 22.—Japan clover (*Lespedeza striata*).

FIG. 23.—Square pod pea (*Lotus tetragonolobus*).

of crude protein as alfalfa or the clovers, it is worth as a green manure two or three times as much as either, because of the enormous amount of herbage produced. Sown in January, it will be ready to be plowed under in May. The seed should be sown broadcast thinly on freshly plowed land and harrowed in.

Lotus uliginosus. Swamp horn clover.

This is a slender branching clover, with heads of rather large yellow flowers, and slender elongated pods. It is a native of northern Europe, where it is esteemed for swampy meadow lands.

Lupinus albus. White lupine. (Fig. 24.)

An annual, native to the Mediterranean region, which is widely grown in Europe, and to a less extent in this country, for soiling and green manure. On rich soil it

grows from 2 to 3 feet high, and is recommended as a crop to plant for the purpose of enriching the ground, and at the same time freeing it from weeds. It has a deep taproot well supplied with tubercles, which gather large amounts of nitrogen from the air. It yields good forage while young, but should not be fed after the flowers appear. The seeds contain a bitter alkaloid. After this has been removed by soaking or boiling the seeds are sometimes used as food.

Lupinus hirsutus. Blue lupine.

The blue lupine is an annual, much resembling *L. albus* in value and habit of growth. Its only use is for turning under as green manure.

Lupinus luteus. Yellow lupine; Scented yellow lupine.

This annual species is the one most generally used in middle Europe to improve sandy soil, as the best of all yet tested. It is satisfactory even on sand dunes along the coast. Like the other lupines, it can be fed green or as hay. The

FIG. 24.—Lupine (*Lupinus albus*).

FIG. 25.—Tarweed (*Madia sativa*).

seeds of this species are very fattening when used as an addition to hay, and are in this respect quite equal to oil cake, while the foliage is said to be not inferior to that of clover, and more bulky. Ninety pounds of seed are required per acre. It should be sown in spring as soon as the ground is warm. It attains maturity very rapidly. Lupines, unlike most other leguminous plants, do not do well on calcareous soil nor on ground which is at all wet, but for improving sandy fields they have few equals. There are about 90 species of lupines native of the United States, principally in the Rocky Mountain and Pacific Coast regions, and many of them have acquired local reputation as being good pasture plants, particularly those that grow in the arid Southwest. One of our species, *L. perennis*, which is common to this country and the Old World, is often cultivated as an ornamental plant in gardens, and has been recommended by German agriculturists as equal in value to white lupine in certain dry soils.

Madia sativa. **Tarweed.** (Fig. 25.)

A rank-growing annual, native to both Chile and California, which has been recommended as furnishing an excellent summer sheep forage. The leaves are clammy with a viscid exudation, and the plant has a rank odor. Its chief merit is its rapid growth. It is cultivated in the arid Southwest and California, and makes a palatable and nutritious food for sheep. An excellent lubricating oil is extracted from the seeds.

Manihot aipi. Sweet cassava; Cassava. (Fig. 26.)

A spurge, native of the Tropics, largely cultivated in the West Indies, Central and South America, and to a less extent in Florida and California. It is a rapid grower, with rank, branching, erect stems 4 or 5 feet high, large, seven-parted, long-stalked leaves, and horizontal fleshy roots or tubers 3 to 5 feet long and from 1 to 2½ inches in diameter. It thrives in loose, dry, sandy loams, and produces from 6,000 to 8,000 pounds of roots per acre on soils of average fertility, to 10,000 or 20,000 pounds on fields that have received a large amount of fertilizers. The roots are fed whole or sliced to all kinds of stock. They contain 72 per cent of starch, 17 per cent sugar and gum, and over 3 per cent of albuminoids. On account of the small amount of flesh formers contained in the roots, they should be fed with some nitrogenous food to make up the deficiency. Cassava is propagated by means of cuttings of the stems, each piece having two or three eyes or buds. These are planted in hills 4 feet apart each way, and the rows rolled, to pack the earth around the cuttings and prevent their drying out. The roots should be dug only as fast as they can be used, as they rot very quickly when exposed to the air.

FIG. 26.—Cassava (*Manihot aipi*).

Medicago denticulata. Bur clover; Medick clover; Medick bur; Toothed medick. (Fig. 27.)

An annual clover, native of the Mediterranean region, which has become naturalized in most warm countries. It was early introduced into California, and has become widely distributed in that State and in the grazing regions of the Southwest. It is not as nutritious nor as palatable as either alfalfa or clover, but fills in the season when other more important forage plants have become dried up by the summer heat. Stock of all kinds fatten upon the burs, which they pick from the plant while it is growing, and search for on the ground after the foliage has become completely dry and dead. It flourishes best in moist valleys and along the coast where there is abundant rain, from January to June. It also occurs

on the drier uplands back from the coast, but does not do so well in such localities. One of its disadvantages is that its prickly burs become entangled in the wool of sheep. It has become widely disseminated over the ranges, and adds much to the value of the summer pasturage. To establish a crop of this clover, the burs may be scattered broadcast in autumn. They will root as soon as the winter rains come. They may be harrowed or cultivated in in the early spring.

Medicago falcata. Yellow lucern; Yellow moon trefoil.

A close relative of alfalfa, much resembling it, but smaller, and with yellow flowers. It grows wild in northern Europe, along roadsides and fence corners, and in light or sterile soils. It has been cultivated to some extent, but is without value, except that it furnishes a scanty pasturage on soils too barren for better and ranker growing species. It is even more susceptible than alfalfa to excess of water in the soil.

FIG. 27.—Bur clover (*Medicago denticulata*).

FIG. 28.—Black medick (*Medicago lupulina*).

Medicago lupulina. Black medick; Hop clover, in part; Yellow clover, in part; Nonesuch; Black nonesuch; Black grass; Shamrock, in part; Lupuline. (Fig. 28.)

An annual or biennial clover, widely grown as a pasture plant in wet meadows and on stiff, clayey soils which are too poor to grow alfalfa or clover. On rich, moist soil it sometimes makes an enormous growth, but ordinarily its only use is in pastures. It is sometimes recommended to be sown mixed with white clover for lawns, as it remains green through the driest summers.

Medicago maculata. Spotted medick; Bur clover; California clover; Black medick; Heart clover; St. Mawe's clover; Arabian snail clover.

An Old World pasture plant, which has become widely introduced in the Eastern and Southern States, as far west as Texas. It is very similar to *M. denticulata* in appearance and in its feeding qualities, and is often mistaken for the latter.

Both species occur in the South, and both are called bur clover. Spotted medick makes a ranker growth than the California plant, often in rich soil attaining a height of 3 or 4 feet, when it is sometimes mowed, making a poor quality of hay. Its principal value is in pastures. Its burs are fattening when once stock have acquired a taste for them.

Medicago sativa. Alfalfa; Lucern; French lucern; French clover, in part; Lucern clover; Lucern medicago; Alfalfa clover; Chilean clover; Brazilian clover; Spanish trefoil; Purple medick; Mannured medick; Cultivated medicago; Medick. (Fig. 29.)

Alfalfa is one of the best known and most extensively grown forage plants throughout the entire United States, with the exception of New England. It is the best hay and soiling crop in the West, and is being rapidly introduced into the Southern and Eastern States. It is an upright, branching, smooth perennial, 1 to 3 feet high, with three-parted leaves, each leaflet being broadest above the middle. The purple pea-like flowers, instead of being in a head, as in red clover, are in long, loose clusters or racemes, scattered over the entire plant. The ripe pods are spirally twisted, and each contains several seeds. Alfalfa is a deep feeder. The taproot descends to a great depth wherever the soil is loose and permeable, often averaging 10 to 15 feet, while extraordinary depths of 50 or 60 feet have been recorded. It will grow in favorable soil anywhere from sea level up to 7,000 feet elevation, and the success or failure of the crop depends as much upon the character of the subsoil as upon the surface layers. Good drainage is necessary, as the plants are killed by excess of water in the soil or on the surface. Water must never be allowed to stand on a field for more than 48 hours at a time. It feeds most heavily on lime, potash, magnesium, and phosphoric acid, yielding better and uniformly heavier crops on the rich prairies west of the Missouri River, which contain a greater percentage of these mineral ingredients than the older cultivated lands of the East. If the subsoil is heavy and stiff and impervious to water, alfalfa will never be a permanent success, no matter how well the surface soil may be prepared. Thorough preparation of the seed bed is the first essential. Plow deeply and subsoil deeply, and before planting the seed, work the field until it is in perfect tilth. Seed should be sown broadcast in amounts of from 15 to 25 pounds per acre, according as to whether a seed crop or a hay crop is desired, as soon as the ground is warm and there is no further danger from frost. Cover the seed very lightly. If sown broadcast, a light harrow or brush would be sufficient; or, if there is rain immediately after

FIG. 29.—Alfalfa: *a*, *b*, seed pod; *c*, seed.

sowing, no harrowing will be necessary. The field selected should be free from weeds, and the alfalfa should be sown without any nurse crop, as the young plants are very tender, and are easily choked out by a nurse crop or a rank growth of weeds. A crop may be cut as soon as it has attained the height of 12 to 15 inches. The second and following crops should be cut when the plant is coming into bloom, as at that period it contains the highest amount of digestible food. A heavier yield may be obtained by waiting, as many do, until the pods commence to form, but the stalks are then woody and less palatable, and there will be more waste in feeding than if it had been cut when in early bloom. Considerable care is necessary in curing, to prevent heating, and especially to prevent the loss of leaves. The best practice is to cure in haycocks. Stacks of alfalfa will not turn water unless they are topped off with marsh or prairie hay, or covered with hay caps. The feeding value of alfalfa is very high, provided the crop is cut in due season; at the time of the first flowering, the crude protein amounts to about 18 per cent, and decreases to 10 or 11 per cent about the time ripe seed is formed. To be used economically, alfalfa hay should be fed with prairie or timothy hay, millet, corn fodder, or some other forage rich in carbohydrates. When cut in time, and properly cured, alfalfa hay is an exceedingly valuable item in the farm economy. Wherever the soil and climate are adapted to it, a field of alfalfa should be on every man's farm.

Medicago tuberculata.

An annual herb which, according to Baron von Mueller, is valuable for pasture lands, as its fruits, although somewhat rough, never become spiny, and do not injure the fleeces of sheep.

Medicago turbinata. Snail clover. (Fig. 30.)

This resembles *M. tuberculata*, and has been recommended by the California Experiment Station for the same purpose. Its pods are liable to become spiny when the plant is grown in rich soil (Von Mueller). It is an excellent winter forage plant in California, the yield of tops and burs being larger than with the ordinary bur clover.

FIG. 30.—Snail clover (*Medicago turbinata*).

Melilotus alba. Sweet clover; Bokhara clover; Large white clover; Tree clover; Cabul clover.

This is a weedy biennial, concerning which extravagant claims have been made. It is chiefly valuable in the Southern States for early pasturage and for green manure. The long tap roots descend deeply into the soil, and when the crop is turned under, a very large amount of available plant food is left for the benefit of succeeding crops. Because of its strong odor, stock will not eat it until they have acquired the taste, but if they are turned into a field of sweet clover in early spring, before the other clovers have commenced to come up, they will quickly learn to eat it. The seed should be sown alone in August, or in February, at the rate of half a bushel to the acre. If sown in spring, a crop may be cut in autumn, and two or three crops the second season. It must never be allowed to go to seed.

Melilotus officinalis. Yellow sweet clover; King's clover; Hart's clover; Plaster clover; Melilot clover; Common melilot; Wild laburnum.

This European species has become quite widely naturalized in this country. It possesses little value—not enough to warrant its cultivation. It grows in swamps and in wet meadows, while *M. altissimus* grows only on the driest soils.

Modiola decumbens. Modiola.

A prostrate, creeping, weedy, annual mallow, native of Chile, which has been introduced into portions of California, and is recommended by the California Experiment Station as an alkali plant. Analyses made of it show that it contains almost as much crude protein as alfalfa. Sheep and cattle are fond of it, and eat it down closely. Because it roots freely at the joints, it is, like purslane,

FIG. 31.—*Modiola multifida.*

FIG. 32.—Sainfoin (*Onobrychis sativa*).

difficult to eradicate, and should be introduced with some caution. A closely related species of very similar habit, *M. multifida* (fig. 31), is a native of low grounds from Virginia southward. This is also valuable as a pasture plant.

Onobrychis sativa. Sainfoin; Esparcette; Asparset; Bourgoyne. (Fig. 32.)

A deep-rooting perennial legume, extensively cultivated in the temperate portions of Europe on dry, calcareous soils which are too barren for clover or alfalfa. The stems are erect or ascending, 1 to 2 feet high, ribbed and downy, the leaves unequally pinnate, composed of 6 to 12 pairs of opposite leaflets, with an odd terminal one. The bright pink flowers are numerous in spike-like racemes, borne on a long stalk. A permeable, well-drained subsoil is essential for its growth. Like alfalfa, it is quickly killed whenever the ground becomes saturated with water, and is therefore not suited for growth in wet meadows or in marshy lands. There is no better plant for growing on barren hills, but it

does better on the sunny slopes than on those facing north. It is rather difficult to establish, as the plants are easily killed when young, but when once well rooted, sainfoin will live from twenty to twenty-five or sometimes a hundred years, provided the soil is rich enough. One crop of hay can be cut each year. It should be cut at the time of full bloom, which in the latitude of Washington, D. C., is about the 1st of May. In England the average yield ranges from 1½ to 2½ tons per acre, and the hay is better and more nutritious than that of red clover. Eighty pounds of seed should be sown per acre, any time from the middle of May to the end of June, and, unlike alfalfa, it should be covered quite deeply to insure germination. If shelled seed is to be had, half as much will suffice. Fresh seed must always be used, as it loses its vitality if kept a year. It can be grown in any part of the United States, and should be more extensively cultivated, especially in localities where the ground is too dry or too barren for red clover. The yield of seed ranges from 10 to 25 bushels of 40 pounds. Sainfoin should not be pastured closely, as it does not have the same recuperative ability as the clovers.

Opuntia engelmanni. Nopal; Prickly pear. (Fig. 33.)

A species of cactus which grows wild from western Texas through the arid regions of the Southwest to California. Its so-called leaves, or flat joints of the stem, are sometimes, in large specimens, a foot long and 9 or 10 inches broad. They are covered with groups of stout spines from one-half inch to 1½ inches long, which point backward on the stem. Throughout the grazing regions of Texas, where this prickly pear grows, it forms one of the most highly valued fodder plants. It is sometimes fed on the range, but the more common, most economical, and safest method of feeding is to prepare the stems by the removal of the spines. They are singed off by holding the joints a moment in a blaze, or the stems are chopped up in a feed cutter without removing the spines, or they are boiled to soften them. This cactus is chiefly utilized in dry seasons, when there is a shortage of grass on the ranges, the succulent stems containing a large amount of water, and enough starch and gum to sustain life. The best way is, however, to feed with hay or cotton-seed meal. Many thousand head of cattle are marketed every year which have been fattened entirely upon prickly pear and cotton seed. A ration of 5 to 7 pounds of the cotton seed and 50 to 60 pounds of prickly pear per head is one usually given. The stems vary from 1 to 6, or sometimes 10 to 12, feet high. They grow in such abundance, and are propagated so easily, that there is little danger of their ever being entirely exterminated. If fed alone, without proper admixture of other foods, prickly pear causes laxity, and when fed to working stock, a tendency to bloat.

FIG. 33.—Prickly pear (*Opuntia engelmanni*).

Ornithopus sativus. Serradella. (Fig. 34.)

An annual legume, native of southern Europe and northern Africa, which is valuable as a fodder plant on moist and sandy sterile soils. At the Pennsylvania Station the yield from two cuttings was 11½ tons of green forage. It does not require lime, and is often used as a green manure to bring up the value of sterile fields. The forage, which is much relished by cattle and sheep, has about the same feeding value as red clover.

Petalostemon. Prairie clover; White prairie clover; Purple prairie clover; Leafy prairie clover. (Fig. 35.)

A number of species of prairie clover are common throughout the prairie region and westward into the Rocky Mountains. They are erect perennial legumes, with

FIG. 34.—Serradella (*Ornithopus sativus*).

FIG. 35.—Prairie clover (*Petalostemon candidus*).

heads of white or purple flowers and finely divided compound leaves. They contribute a considerable amount of forage on the prairie pastures, and should be given a trial in cultivation.

Phaseolus diversifolius. Creeping kidney bean.

An annual, with prostrate spreading leafy stems, common on the prairies and cedar glades of the Southern States. The foliage is eaten by cattle and sheep.

Phaseolus helvolus. Long-stalked kidney bean.

A perennial bean with slender diffuse stems. A single plant makes a large quantity of herbage. Common in the Southern States, where, in certain localities, it produces a large amount of forage.

Phaseolus perennis. Wild kidney bean.

A species closely related to the garden bean, widely distributed over the eastern and southern United States, and as far west as the Mississippi River. It grows in woodland copses and along the banks of streams, and wherever found is eaten greedily by stock. It should be given a trial in cultivation.

Pisum arvense. Gray winter pea; Canada field pea; Field pea.

The common field pea is a native of Italy, and has been in cultivation for a good many hundred years. It is grown chiefly for its seeds, which are used both as an article of diet and for fattening cattle. It is one of the best soiling crops for milch cows, and is largely used in the Northern States and Canada and as far west as the Dakotas for this purpose, and for green manure. The seed is sown broadcast and harrowed in. It is planted in early spring, and is ready to cut in May or June. For soiling, the fodder is sweet, palatable, and very nutritious. It also makes an excellent quality of ensilage. It grows best on light calcareous loams and produces heavy crops on rich land.

FIG. 36.—Garden pea (*Pisum sativum*).

FIG. 37.—Knotweed (*Polygonum aviculare*).

Pisum sativum. Garden pea. (Fig. 36.)

The garden pea, so generally cultivated as an early spring vegetable, is equally valuable as a fodder crop, but it requires richer land and is more quickly affected by drought than the field variety. Some botanists regard this as a cultural variety of the field pea.

Pithecolobium brevifolium. Huajillo.

A spiny leguminous shrub, indigenous to the lower Rio Grande. According to Dr. Havard, the permanent foliage is readily eaten by sheep and goats in the winter time.

Plantago lanceolata. Rib grass; Plantain; Ripple grass; Plantain herb; Rib herb.

A weed extensively naturalized in this country in lawns and meadows, and truly considered a vile pest, but in Europe frequently recommended for sowing in pasture mixtures. It possesses the advantage of growing on the most sterile soils. Cattle and sheep are fond of it when young. There are a number of American species, widely distributed in all parts of the country, many of which add value to the scanty spring forage in barren pastures. Some species of the prairie region grow on salt marshes and alkali spots, and would perhaps be of value for cultivation on such soils.

Polygonum aviculare. Knotweed; Duckweed; Dooryard grass. (Fig. 37.)

A weedy annual of the knotweed or smartweed family, common everywhere in dooryards, waste places, and fields. The stems are slender, prostrate or ascending, branching, 6 to 14 inches high, and leafy; the leaves oblong to lanceolate, from one-fourth of an inch to an inch long, pointed at each end, and bluish green. It is very hardy, growing readily on the poorest of ordinary soils, even in times of drought, and is greedily eaten by all kinds of stock. Stockmen in the Northwest esteem it highly, as it furnishes a palatable and nutritious forage, which continues green all summer under all kinds of hard treatment. The dry forage contains nearly 19 per cent of crude protein. so that its value as a flesh former is high, ranking above that of the clovers.

Polygonum erectum. Upright knotweed.

A hardy annual knotweed, widely distributed through the Northern States. In the upper prairie region it is highly valued as a forage plant for milch cows. It grows from 10 to 15 inches high, and in rich, moist soils may be cut for hay. The hay is nutritious, containing 11 per cent of crude protein.

Polygonum muhlenbergii. Knotweed; Smartweed.

This species has been very highly spoken of as a summer forage plant for wet meadows and marshy places. It is abundant throughout the United States, and is one of the species which would not become a weed if brought under cultivation. Cattle are very fond of it. There are numerous other species which, in the localities where they grow, add materially to the value of pasturage.

Polygonum sachalinense. Giant knotweed; Sachaline; Sacaline; Saghalin Polygonum.

Giant knotweed or sachaline is a hardy herbaceous perennial, 6 to 12 feet high, with strong creeping rootstocks, broad, somewhat heart-shaped, shining leaves nearly a foot long, and small greenish-white flowers appearing late in the season. It has been cultivated for a good many years as an ornamental. Recently attempts have been made to introduce it into this country as a forage plant, and extravagant claims have been made concerning it. Considering that it is a native of northern Asia, growing along moist river banks upon an island with a cold and very moist climate, and from the recommendations as to its culture by horticulturists who have had experience in growing the plant, it is very doubtful if it will prove a success except in swampy waste lands. The leaves are eaten by cattle, but the small quantity of forage produced and the time which one must wait until production commences, preclude its ever being of great value in this country.

Portulaca oleracea. Pusley; Purslane.

This well-known weed is of considerable value as an autumn forage plant in the South and Southwest. The fleshy leaves and stems are put forth in great abundance during the hottest and driest weather, and it is hard to kill. The same qualities which make it a vile pest in our gardens and cultivated fields

cause it to be highly esteemed by sheep herders and cattlemen in years of drought. Fed to cows it increases the flow of milk, but causes laxity if too much is given at once.

Potentilla. Cinquefoil; Five-finger.

There are a number of species of potentilla, native to the prairie regions west of the Missouri River. According to Professor Bessey, they contribute some value to the native pastures. They belong to the Rose family, and are closely related to the strawberry, which they resemble in foliage and habit of growth.

Poterium sanguisorba. Burnet; Burnet clover; Salad burnet. (Fig. 38.)

A so-called clover, belonging to the Rose family, the foliage of which resembles that of sainfoin. In the early part of the present century its cultivation was highly recommended, and extravagant claims were put forth concerning it, but it is

FIG. 38.—Burnet (*Poterium sanguisorba*).

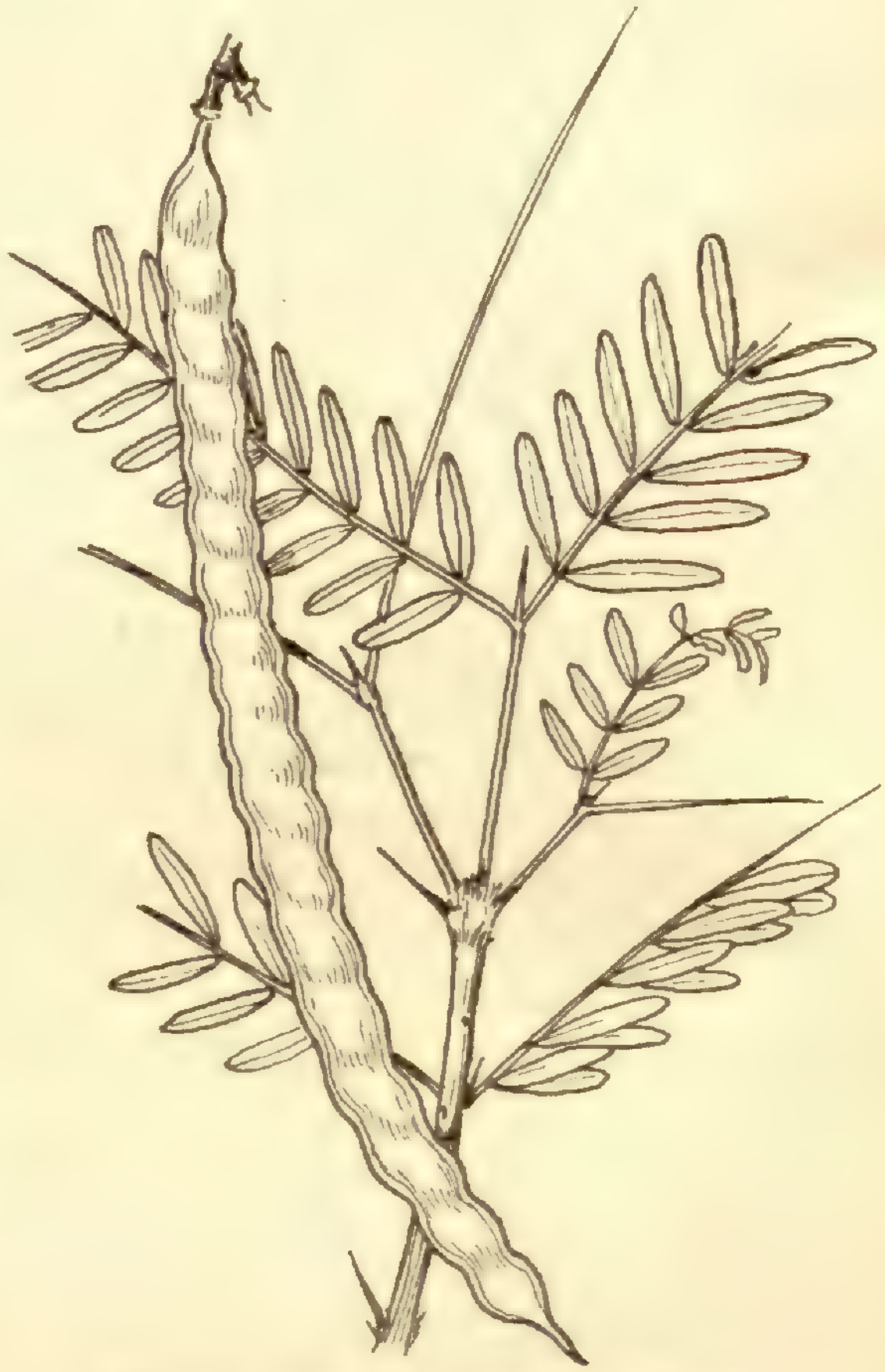

FIG. 39.—Mesquite (*Prosopis juliflora*).

now only used in mixtures for sheep pastures on dry and barren sandy or calcareous fields, such as are suited to the growth of sainfoin. The seeds of burnet are sometimes used to adulterate the latter, to which it is inferior in value, because of the smaller amount of forage which it produces. The dry hay contains about 15 per cent of crude protein.

Prosopis juliflora. Mesquite tree; Screw bean. (Fig. 39.)

A thorny, leguminous shrub, growing in favored localities to a tree from 20 to 40 feet high, with a trunk 2½ feet in diameter. It is widely distributed from Texas to southern California, through tropical America to Argentina. The leaves are very good browsing for horses and cattle. It bears two crops of beans a year, which are next to barley for fattening horses, cattle, sheep, and hogs. The leaves, pods, and bark are rich in tannin, and a gum, similar to gum arabic,

exudes copiously from the trunk and branches. The wood is hard, strong, and durable, and takes a high polish. It is the most common woody plant of the mesas of the Southwest, and because of its many uses is an exceedingly valuable species.

Prosopis pubescens. Tornillo; Screw bean.

A shrub or small tree similar to the mesquite, abundant along the Rio Grande and its tributaries. The pods are eaten by cattle. They are also used as food by the Mexicans and Indians. It may be distinguished from *P. juliflora* by its thick, spirally twisted pods, those of the former being straight or curved.

Psoralea esculenta. Pomme blanche; Pomme de prairies; Prairie turnip.

A perennial legume common throughout the prairie region. It produces edible tubers. Formerly used as food by the Indians and the voyageurs, and probably of some value as food for hogs.

Psoralea glandulosa. Jesuit's tea.

A trifoliate, bushy, leguminous shrub, native of Chile, which there grows in gullies and water courses which are dry in summer, and is eaten by cattle and horses. It is being introduced into similar regions in California as a forage plant.

Psoralea melilotoides.

This and other species occur on dry pasture lands in the Southern States, and are said to be good for all kinds of stock. There are about a dozen species native to the prairie region, which add value to both pasturage and hay. Because of their tough, slender roots they are commonly known as "shoe strings."

FIG. 40.—Mexican clover (*Richardsonia scabra*).

Richardsonia scabra. Mexican clover; Spanish clover; Ipecac weed; Florida clover; Water parsley; Bellfountain; Poor toe; Pigeon weed. (Fig. 40.)

An annual weed, native of Central America and Mexico, which has been introduced into the Southern States and has now spread along the Gulf westward into Texas. It is a succulent, creeping, prostrate plant, chiefly valued as a renovator of sandy fields on the coast. It is not a true clover, but belongs to the Rubiaceæ, the family in which coffee is included. Reports concerning it are conflicting. According to some it is a valuable pasture plant, while others affirm that neither cattle nor horses will eat it. On rich lands it can be cut, making a nutritious and palatable hay, which is readily eaten by all kinds of stock. Chemical analysis shows that the hay contains nearly as much nutriment as red clover. It is never cultivated, but appears as a weed after corn and cotton have been laid by. In Florida it is considered an excellent plant to grow in orange groves as a mulch, and to turn under for green manure.

Rubia tinctoria. Madder.

The foliage of this prickly dye plant makes forage of fair quality if cut the second season before the plants have commenced to blossom.

Salicornia herbacea. Saleratus weed; Samphire; Glasswort.

A low, fleshy, leafless herbaceous plant, growing in the borders of salt marshes from Arizona to the Saskatchewan and along the Atlantic coast. It grows on soils too salty or too alkaline to support any other plant. In portions of Arizona and in Utah it is valued highly for winter feed. After frost, stock live almost entirely upon it and "winter fat."

Sarcobatus vermicularis. Greasewood. (Fig. 41.)

An erect, scraggy shrub 2 to 8 feet high, with the leafy branches covered by smooth, white bark. It is one of the most common of the shrubs called "greasewood," in the region from Montana to New Mexico and Arizona, and where it is abun-

FIG. 41.—Greasewood (*Sarcobatus vermicularis*).

FIG. 42.—*Sida elliottii*.

dant, supplies a considerable part of the winter forage on the ranges. This and the saleratus weed belong to the Pigweed family, of which the Australian saltbush, so widely recommended for culture on alkaline soils, is a member.

Schrankia angustata and **S. uncinata.** Sensitive briar; Sensitive plant.

These herbaceous or shrubby legumes with prickly stems and sensitive leaves occur throughout the southern half of the prairie region. The foliage is eaten by stock and contributes some value to the native pastures.

Scirpus atrovirens. Meadow rush.

A sedge with rather stout, triangular stems 1½ to 3 feet high, and broad, smooth, bright-green leaves which become rigid with age. Widely distributed through

the upper prairie and lake regions in wet, boggy meadows. It is readily eaten by stock, although it does not occur in sufficient quantities to be of much value.

Scirpus fluviatilis. River club-rush.

A stout, erect perennial sedge, with sharply three-angled stems 3 to 5 feet high, and large, broad, flat leaves, which are smooth except on the midribs and margins, where they are more or less rough. It is common on the borders of lakes and large streams from New England west to the Dakotas and Iowa, and from its abundance is a valuable species, especially for early feed. In wet meadows it often contributes a large percentage of the feed. The hay contains 10 per cent of crude protein.

Scirpus hallii. Hall's rush.

A slender tufted sedge, 6 inches to a foot high, growing on the borders of ponds from Texas to South Dakota. It is readily eaten by stock. Hay of this species contains 10 per cent of crude protein.

Scirpus maritimus. Sea club-rush.

A perennial sedge with sharply three-angled, stout, erect stems, 1 to 3 feet high, and flat linear leaves as long as the stems. It is common in saline localities on the coast from Nova Scotia to Florida, and in the interior across the continent. It furnishes a large amount of coarse forage, and is often converted into hay of fair quality, because it can be cut early in the season before the grasses are in condition to mow. Hay made of it contains nearly 10 per cent of crude protein.

Sida elliottii. Elliott's sida. (Fig. 42.)

A low, shrubby or bushy plant of the Mallow family, native of the South, which grows 1½ to 2 feet high on hard, clayey soils and rocky land. It is an excellent pasture plant which readily catches from seed, provided the surface soil is scratched with a rake when the seed is scattered. Cattle, sheep, and hogs are fond of it, but horses and mules do not relish it. This sida has been quite widely introduced in the grazing regions of California. It apparently thrives better without than with irrigation, and is therefore of much value on waste lands designed for permanent pastures. It is not a good soiling crop, and should not be cut for hay.

Sida spinosa.

A weed of the Mallow family, which occurs in the Southern States. It has been recommended as a good crop for renewing worn lands, and makes very fair winter grazing for cattle.

Solidago. Golden rod.

There are a great number of species distributed throughout the United States. In New York and in other portions of the East where sheep are grown golden rod is highly esteemed as a fattening, healthful, and nutritious forage, though cattle and horses will not touch it.

Spergula arvensis. Spurrey; Sand spurrey.

An annual, producing a low, tangled mass of succulent stems with numerous whorled linear leaves. It produces a crop in eight or ten weeks, and is valuable as a catch crop in short seasons, and for soiling sheep and milch cows. It has been especially recommended as a first crop on the pine barrens of Michigan, to turn under for green manure. The air-dried hay contains about 12 per cent of crude protein.

Spergula maxima. Giant spurrey. (Fig. 43.)

Similar to common spurrey, but making a ranker growth. It is also slightly richer in flesh-forming ingredients, and is the more valuable species of the two.

Symphytum asperrimum. Prickly comfrey; Comfrey.

A coarse, rank-growing perennial herb, with purple flowers in nodding one-sided clusters, and large, rough leaves. A native of the Caucasus, which has been widely introduced and recommended as a forage plant for rich soils. It has been claimed that an enormous quantity of forage may be cut from an acre, but after extended trials in this country it has been determined to be of less value than the clovers, and is now rarely grown. It is propagated from the roots, which are set in rows 18 inches apart, and 16 inches in the rows. Its cultivation is not recommended, except when it is desired to procure an enormous bulk of forage from a small amount of very rich land. Prickly comfrey has proved a success only in New York, Michigan, and Florida, in the latter State having been recommended as a good forage plant for waste lands.

FIG. 43.—Giant spurrey (*Spergula maxima*).

FIG. 44.—*Thermopsis montana*.

Taraxacum dens leonis. Dandelion.

A weed, widely distributed over the United States, introduced from Europe in grain and grass seed. Its leaves furnish a scant but palatable and nutritious early forage in pastures for sheep, and the seed is therefore sometimes used as an ingredient of pasture mixtures.

Tetragonia expansa. New Zealand spinach.

An annual herb of the order Ficoideæ, native of the seacoasts of Chile, Japan, Australia, and New Zealand. Used as a vegetable, and also recommended as valuable in sheep pastures in arid regions and on alkaline or saline soils.

Thermopsis mollis. Downy leafed thermopsis.

A perennial legume with palmately trifoliate leaves and yellow flowers in terminal racemes. The stems are 2 to 3 feet high. A native of the mountains of southern Virginia and North Carolina, which is readily eaten by stock.

Thermopsis montana. (Fig. 44.)

A stout perennial herb with erect clustered stems 2 or 3 feet high, native of the Rocky Mountains. It is considered one of the best forage plants on the range, and makes a hay readily eaten by stock, if cut before the stems become woody. Another species, *T. rhombifolia*, grows in the eastern Rocky Mountains from Colorado northward. It is a good forage plant, though less abundant than the former species.

Tillandsia usneoides. Spanish moss; Long moss.

An epiphyte belonging to the Pineapple family, abundant in Florida and the Gulf States, where it is a characteristic feature of the forests with its long stems hanging in festoons from the tree trunks and branches. Cattle eat it, and it adds considerable value to the woodland pastures.

Tribulus maximus.

A loosely branched, hairy, prostrate herb, related to the creosote bush, occurring in dry soils in western Texas and the arid Southwest. It is eaten by sheep and cattle. It springs up all over the country when there is plenty of rain, and is highly valued by stockmen on the plains.

Trifolium agrarium. Golden clover; Yellow meadow trefoil; Yellow hop clover; Field clover; Hop clover; Yellow clover; Gold-colored clover; Large golden clover.

A perennial wild European clover, widely naturalized on sandy fields and by road sides in the Eastern States as far south as Virginia. It is of considerable value for sandy pastures.

Trifolium alexandrinum. Egyptian clover; Alexandrine clover; Bersine clover. (Fig. 45.)

FIG. 45.—Egyptian clover (*Trifolium alexandrinum*).

An erect, annual clover, native of Egypt, which in warm climates and upon rich soils makes an exceedingly rapid growth. Two or three heavy crops may be taken from a field in one season. Twenty pounds of seed are required for an acre. An excellent species for trial in the Southern States, wherever cane and cotton may be grown.

Trifolium alpinum. Alpine clover.

A European alpine species of little value in cultivation, although it has been recommended abroad as a forage plant for mountain meadows.

Trifolium amphianthum. (Fig. 46.)

A low, slender stoloniferous species occurring in Louisiana and Texas upon the most sterile soils. It spreads rapidly, and reseeds itself freely, producing a large amount of early spring pasturage. It comes into blossom about the middle of May. It is one of our most promising native wild clovers for cultivation.

Trifolium arvense. Rabbit foot clover; Haresfoot clover; Field clover; Field trifolium; Stone clover, in part; Welsh clover, in part; Hard clover; Hair clover, Hare clover; Hare's little paw; Mouse clover; Cat clover; Kitten plant; Pussywort; Gray clover; Lamb's tail.

A silky branching annual, 5 to 10 inches high, with soft, grayish oblong heads of flowers. Common in old fields and on barren lands in the eastern and southern United States. Of little value.

Trifolium badium. Brown clover (English); Chestnut-brown clover (German).

A clover, native of England and northern Europe, which has some slight value as a forage plant in pastures.

FIG. 46.—*Trifolium amphianthum.*

FIG. 47.—Alsike (*Trifolium hybridum*).

Trifolium beckwithii. Beckwith's clover.

A native of the eastern Rocky Mountain and Upper Missouri prairie regions. It has ascending stems 4 to 9 inches high, from strong perennial creeping rootstocks. It is very persistent, and endures all kinds of hard usage. Being much relished by stock, there is a possibility that it may prove of value as a cultivated forage plant. The dry hay contains nearly 14 per cent of crude protein. Beckwith's clover is highly valued by stockmen in the Northwest.

Trifolium carolinianum. Carolina clover.

A small, perennial, procumbent, tufted clover, widely disseminated in waste places from Pennsylvania to Florida and Texas. It furnishes a small amount of forage, especially in the southwestern extension of its range.

Trifolium filiforme. Suckling clover; Yellow suckling clover; Slender clover; Small-flowered clover; Thread clover; Slender-stalked clover; Little yellow hop clover; Golden clover.

Indigenous to northern Europe on sandy clay soils. A very nutritious forage in sheep pastures, it is often used in mixtures with grasses and clovers for wet, sandy meadows.

Trifolium fragiferum. Strawberry clover; Strawberry-headed trefoil; Bladder clover.

A wild clover, native of England and northern and central Europe, which much resembles white clover in appearance and nutritive qualities. It is a valuable species for cultivation in wet meadows.

Trifolium furcatum.

A rank-growing clover 2 to 3 feet high, native of the Pacific Coast. The flowers resemble those of common red clover, but are larger, sometimes 2 inches in diameter, and borne on long stalks. It is abundant throughout the coast ranges and affords good pasturage.

Trifolium hybridum. Alsike clover; Alsace clover; Hybrid clover; Bastard clover; Swedish clover; White Swedish clover; Giant white clover; Perennial hybrid clover; Elegant clover; Pod clover. (Fig. 47.)

A perennial, in size and general appearance intermediate between white and red clover. It is better adapted than any other species in general cultivation to wet meadows or marshy lands, but because of its shallow root system will not withstand drought. The branching leafy stems grow 1 to 3 feet high, and the young flower heads are at first white and later become rose-colored. Its leaves are slightly bitter, and on this account the forage is not so well liked by stock as that of red or white clover; but it will grow on lands which are too wet for the other species, thriving even in marshy places where the subsoil is impervious to water and the drainage is bad. It may also be cultivated in the far North and in high altitudes, as it has the power of withstanding severe cold. The forage is succulent and more difficult to cure for hay than red clover. The air-dried hay contains from 10 to 13 per cent of crude protein. It is a very good honey plant for bees. The seed weighs 65 pounds to the bushel, and 12 pounds will sow an acre.

FIG. 48.—Crimson clover (*Trifolium incarnatum*).

Trifolium incarnatum L. Crimson clover; Scarlet clover; German clover; German mammoth clover; Italian clover; French clover, in part; Egyptian clover, in part; Carnation clover. (Fig. 48.)

An annual, native of the the Mediterranean region, which has been long cultivated in the warmer portions of Europe, and is now grown in many of the Eastern and Southern States for an early soiling crop. The stems are erect, tufted, soft-hairy all over, from 1 to 2 feet high, and the bright scarlet flowers are borne in elongated heads. In Virginia and southward it should be sown in autumn to furnish winter and early spring forage. It is susceptible to drought. It is not suited to the Northern and Northwestern States, as it suffers severely from excessive cold. Twenty pounds of seed should be sown per acre. Hay made of crimson clover

contains about 13 per cent of crude protein. To make the best hay, it must be cut when in full bloom; cut later, there is some danger in feeding it, especially to horses, on account of the bristly hairy bracts of the inflorescence, which form hair balls in the stomach. A number of such cases, resulting in considerable loss, have been reported during the past seasons.

Trifolium involucratum.

An annual 1 or 2 feet high, with leafy, branching stems, terminating in from 1 to 3 purplish heads. It has a wide range throughout the West.

Trifolium medium. Cow grass; Cow clover; Large American clover; Mammoth clover; Large clover; Fall clover; Saplin or sapling clover; Pea-vine clover;

FIG. 49.—*Trifolium megacephalum.*

FIG. 50.—Red clover (*Trifolium pratense*).

Meadow clover; Sand clover; Zigzag clover; Clover trefoil; Medium clover; Early clover; Wavy-stemmed clover; Zigzag hare clover; Red perennial meadow clover; Soiling clover; Perennial red clover.

A rank-growing perennial with zigzag stems, oblong, entire, spotless leaflets, and stalked heads of purple flowers. It is better adapted to wet meadows or marshy lands than is the ordinary clover, and in such places makes a very rank and rapid growth. It has about the same feeding value as red clover, and is well adapted to soiling purposes. Ten pounds of seed should be sown per acre.

Trifolium megacephalum. (Fig. 49.)

This wild clover grows in the mountains from Montana to California. It is distinguished from red clover, which it somewhat resembles, in having unbranched stems about a foot high, and wedge-shaped five to seven parted leaves which nearly all arise from the base of the stalks. The terminal flower head is about 1½ inches long. It is one of the best native pasture plants of that region.

Trifolium microcephalum.

A wild species, very common on lowlands in southern California, and well liked by stock. It should be valuable in cultivation.

Trifolium minus. Yellow clover.

A European annual, extensively naturalized in the Eastern and Southern States in sandy fields and along roadsides. It has a habit similar to that of Japan clover, for which it is often mistaken. It affords a small amount of forage in early summer, but its chief value is that it spreads rapidly over the most barren soils, and thereby prevents the washing away of the surface.

Trifolium ochroleucum. Sulphur clover.

A perennial European species 10 to 15 inches high, with elongated heads of pale yellow flowers. It grows wild upon the driest calcareous soils, and when cut makes a palatable and nutritious hay, which is greedily eaten by cattle.

Trifolium pannonicum. Hungarian clover.

A perennial species indigenous to southern Europe, closely allied to red clover and much earlier, but less readily eaten by stock.

Trifolium pratense. Red clover; June clover; Early clover; Small red clover; Red top clover; Medium red clover. (Fig. 50.)

A biennial or short-lived perennial clover, native of the Old World, but now extensively cultivated in both hemispheres. It is ascending, more or less branching, 1 to 2 feet high, with trifoliate leaves on long leaf-stalks and oval or blunt leaflets half an inch to an inch and a half long, with a large pale spot on the upper side, and pink flowers in large, rounded, stemless heads. Red clover holds the same position as a forage plant in the Eastern and Northern States as alfalfa in the Southwest and West, or as cowpeas in the South. Its cultivation is almost universal. The seed is sown at the rate of from 15 to 20 pounds per acre, from March to May, either alone, or more commonly with grain. It requires a deep, rich, fertile, calcareous loam, neither too wet nor too dry. On the black-waxy and gumbo soils of the Mississippi Valley, red clover is almost sure to freeze out or "heave" in winter, and on rocky or light, sandy soil it suffers from drought in summer. It is mown for hay twice in the season, the yield varying from three-fourths of a ton to 2 tons at each cutting. The hay contains from 12 to 16 per cent of crude protein, varying according to the fertility of the soil. The yield of seed ranges from 3 to 9 bushels, of 60 pounds each, per acre. It is one of the best money crops of the Eastern farmer, and is an excellent one for pasturage, soiling, hay, or to turn under for green manure.

Trifolium procumbens. Hop clover; Yellow clover; Shamrock clover; Brown clover; Lesser clover; Low hop clover; Hop trefoil.

A low, annual, yellow-flowered species, with spreading or ascending stems, widely naturalized in the Eastern and Southern States. It is common on sandy fields and roadsides, and furnishes scanty pasturage for stock in early summer. It resembles Japan clover, and in the South is often mistaken for it.

Trifolium reflexum. Buffalo clover; Pennsylvania clover. (Fig. 51.)

A native annual or biennial species with ascending downy stems, oblong, finely toothed leaflets, and rose-red flowers on short stalks in a round, stalked cluster. The flowers are reflexed and brownish in fruit. Widely disseminated from western New York to Nebraska, Kansas, and southward, and especially abundant in the middle prairie region, where it furnishes a considerable amount of palatable and highly nutritious forage, greedily eaten by all kinds of stock. It is a species which should be brought into cultivation.

Trifolium repens. White clover; White Dutch clover; Dutch clover; Creeping trifolium; White trefoil; Stone clover, in part; Honeysuckle; Honeysuckle grass; Honeysuckle clover; Shamrock. (Fig. 52.)

A smooth perennial, growing wild in New England and Europe, and now widely cultivated. The slender spreading and creeping stems are from 4 to 8 or 10 inches long; the trifoliate leaves are on rather long leafstalks; the flowers are white or rose color, borne in loose heads an inch or less in diameter, on very long stalks. It grows on a great variety of soils, forming excellent turf either for pastures or lawns, and thrives under all sorts of hard usage. If sown alone from 6 to 8 pounds of seed should be used, but it is usually mixed with the seed of grasses or other clovers. The forage, though produced in small quantity, is sweet and nutritious and eagerly sought for by all kinds of stock.

FIG. 51.—Buffalo clover (*Trifolium reflexum*).

FIG. 52.—White clover (*Trifolium repens*).

Trifolium resupinatum. Reversed clover.

An annual species, native of the Mediterranean region, similar to white clover in its manner of growth, and better adapted to warm regions than white clover. It has been introduced into and is largely grown in northern India as a pasture plant, and would be a valuable species to introduce for pasturage in the Southern States.

Trifolium rubens. Reddish clover; also known in Germany as Red clover; Fox clover; Fox tail clover; Red goat clover; Red hare clover.

A perennial species, native of southern Europe, similar in appearance to crimson clover, but with purple flowers and much narrower and longer leaflets. It is cultivated for soiling purposes in the warmer portions of Europe, and, though less hardy than the crimson clover, would be a good species for introduction into the Southern States.

Trifolium stoloniferum. Running clover; Running buffalo clover. (Fig. 53.)

A low, smooth perennial, which sends out long runners from the base of the stem. The flowers are white, tinged with purple, in loose heads. The leaflets are broadly obovate and minutely toothed. A native species, growing in open woodlands and prairies from Ohio west to Kansas, which is greedily eaten by cattle. It should be given a trial in cultivation.

Trifolium subrotundum. Mayad clover.

A perennial species, native to and cultivated in northern and middle Africa, up to 9,000 feet elevation. It is a good species for cultivation in countries too warm for red clover, and ought to do well in the Southern States.

Trifolium tridentatum.

A wild species, occurring in Nevada and Utah, which produces a palatable and nutritious forage in early summer, and is greedily eaten by cattle. It deserves to be brought under cultivation. The Western and Pacific Coast States are very rich in the number of wild clovers which occur there. California alone has more than sixty species. All are valuable forage plants, but few, if any, have ever been given a trial in cultivation.

Triglochin maritimum. Seaside arrow grass; Arrow grass.

A marsh plant with cylindrical leaves and flowering stalk 1 to 3 feet high, common along the Atlantic coast and westward across the continent in saline, marshy, and boggy places. It is eaten by cattle, and adds some little value to the native herbage of wet pastures.

Trigonella fœnum-græcum. Fenugreek; Buckhorn clover; Cow horn; Goat's horn; Sevenseed; Greek hay; Trigonel.

An erect annual legume growing 6 to 12 inches high. The plant has a strong odor, and is valueless for forage unless it is cut before the plant commences to bloom. The seeds are given to horses as a condiment. It is sometimes recommended for pasture mixtures, but has small value for any purpose.

FIG. 53.—Running buffalo clover (*Trifolium stoloniferum*).

Ulex europæus. Gorse; Whin; Furze. (Fig. 54.)

A perennial leguminous shrub, native of northern Europe, where it is highly esteemed as a forage plant for dry and barren hillsides, in places too steep or where the soil is too thin to admit of the cultivation of better ones. In some parts of Ireland and Wales the farm horses are almost entirely maintained upon it during the winter months, the crushed 2-year-old branches being fed at the rate of about 40 pounds per day. Twenty or 25 pounds of seed are required for an acre. It is a valuable forage plant to sow on barren hillsides. Sheep are very fond of and fatten quickly upon it.

Mo. Bot. Garden

Vicia americana. Common wild vetch.

A smooth perennial with compound leaves, elliptical or oblong obtuse leaflets, and 4 to 8 purple flowers on elongated flower stalks. It grows in moist soil from New York westward to the prairie region. A valuable native vetch, which should be given a trial in cultivation.

Vicia cracca. Bird vetch; Chicken vetch. (Fig. 55.)

A downy pubescent perennial with compound leaves of 20 to 24 narrowly oblong, abruptly pointed leaflets, and numerous blue or purple reflexed flowers in a one-sided spike. Common in the borders of thickets from New England to the upper prairie region. The species is cultivated in Europe for fodder, and is recommended for cultivation in wet meadows. In the shade it yields a return three times larger than in open places. It would, therefore, be valuable in woodland pastures and alpine regions.

FIG. 54.—Gorse (*Ulex europæus*).

FIG. 55.—Bird vetch (*Vicia cracca*).

Vicia faba. Faba vulgaris.

Vicia gigantea.

A tall perennial, growing in the forest regions of Oregon and Washington, and highly valued there as a forage plant. It deserves to be brought into cultivation.

Vicia ludoviciana. Louisiana vetch.

A wild vetch, occurring in the southern prairie region and in the Southern States, where it makes a fair amount of nutritious grazing.

Vicia micrantha. Small flowered vetch.

A smooth vetch, with 4 to 6 linear obtuse leaflets, common throughout the Southern States. It is eaten by cattle wherever it occurs, and should be grown under improved conditions.

Vicia peregrina.

An annual, native of southern Europe and cultivated there, and considered better than the ordinary vetch for sandy soils. It would be valuable for like soils in the South.

Vicia sativa. Vetch; Spring vetch; Tares.

An annual trailing herb 12 to 20 inches high, with 4 to 5 angled stems, simple or branched from the base. The leaflets are broadest above the middle, blunt or notched at the end, and tipped with an abrupt point; they number usually from 10 to 14. The rather large purple flowers are borne one or two together at the base of a leaf. The plant is soft-hairy all over. This native of Europe and western Asia has been cultivated for upward of twenty centuries, and is considered one of the best soiling crops in cool, moist climates. In the United States they have only proved adaptable to cultivation in the New England States and Canada. Vetches are sown in April or May, at the rate of 2 bushels of seed per acre, and the crop is ready to cut by the middle of June or the first of July. Where they can be grown, they are a very good summer feed for horses, but must not be fed earlier than full bloom, on account of their diuretic action. They are good for soiling sheep and milch cows, and are said to very materially increase the flow of milk. Because of the high price asked for seed, and the extreme susceptibility of vetches to dry, hot weather, their cultivation is not recommended. A greater and surer return can always be had from red clover.

Vicia sitchensis.

A native of the Pacific Coast from California to Alaska, valuable for forage, and deserving cultivation.

Vicia sylvatica. Wood vetch.

A perennial indigenous to Europe and northern Asia. It has been grown successfully as far north as 67° north latitude and is available for alpine or subalpine pastures. The yield of forage is large and it is readily eaten by all kinds of stock.

Vicia tetrasperma. Lentil vetch; Lentil tare.

An Old World annual which, according to Langethal, is preferable to the ordinary vetch for sandy soil. It also makes a better and more palatable forage. It is suited to cultivation in the Southern States, especially upon light, calcareous soils.

Vicia villosa. Hairy vetch; Sand vetch; Russian vetch. (Fig. 56.)

An annual, native to western Asia, which has been cultivated for about fifty years. Hairy vetch is an excellent soiling crop, one of the best that has been introduced into the United States, although, on account of the high price of the seed and the large amount which must be sown per acre, it has not been widely cultivated. The seed should be sown at the rate of a bushel and a half per acre, from the latter part of April to the middle of May for summer forage, or from the middle of August to the middle of September for winter forage. The nutritive value of the hay is very high, analyses by Coudon in 1890 showing 23 per cent of crude protein. The yield varies from 1½ to 4 tons per acre, according to the fertility of the soil. It has been grown successfully in all parts of the country and has proved to be hardy in the moist coastal regions of Washington, the dry prairies of South Dakota, and the rich loamy soils along the Gulf. It is deserving of wider cultivation in all parts of the United States.

Vigna catjang. Cowpea; Southern cowpea; Pea; Field pea; Stock pea; Cherry bean; Chinese vetch.

A leguminous annual of unknown origin, which has been cultivated in oriental countries for many centuries, both as a forage plant and for the seeds as an arti-

cle of human diet. It is especially adapted to warm countries and is extensively cultivated throughout the South, having been introduced there about the middle of last century. There are many named forms or cultural varieties, all of which, however, are considered by botanists to be derived from one species. It so readily adapts itself to different soils and changes its characters so readily under cultivation, that there has been much difficulty in determining the limits of the various named forms. The cowpeas are of three general classes, according to their habit of growth, consisting of "bunch" varieties, which grow erect and compact; "runners," which start off erect and then throw out running branches; and "trailers," which grow flat upon the ground with long stems sometimes 15 or 20 feet in length. There is also much variation in size, shape, and color markings of the seeds, and in the manner in which the seeds are borne in the pod, the seeds of some being closely crowded together, called "crowders," and others with the seeds wide apart and the pods constricted between each seed, called "kidney" peas. The bunch varieties are the ones which are best adapted to growing for hay or ensilage, while the runners and trailers are valuable for soiling purposes or for turning under as green manure. The length of season required for maturity also varies greatly, the bunch varieties, as a rule, requiring only a very short season. The feeding value of cowpeas, either green, fed as hay, or preserved as ensilage, is very high, being considerably above that of red clover. Cowpeas require a deep, rich, sandy loam, although, because of their strong root system, they are adapted to grow upon almost any soil which is not too wet. The ground should be well prepared and the seed should not be sown until the soil is thoroughly warmed. Cowpeas, by means of the tubercles on the roots, gather large amounts of nitrogen from the air, and also pump up large amounts of valuable mineral fertilizers from the subsoil. When the stubble is plowed under after the crop has been removed, these valuable fertilizing elements—potash, nitrogen, and phosphoric acid—are left in the surface soil for the use of succeeding crops. At the Rhode Island Experiment Station the total crop of green vines per acre was 35,000 pounds, containing 157 pounds of nitrogen, 109½ pounds of potash, and 32.2 pounds of phosphoric acid, and the additional quantity estimated to be contained in the roots was 17¾ pounds nitrogen, 10 pounds of potash, and 5.15 pounds phosphoric acid. The percentages of fertilizers vary greatly, according to the fertility, and to some extent according to the variety grown. Experi-

FIG. 56.—Hairy vetch (*Vicia villosa*).

ments at Southern stations have unanimously proved that the best way to utilize fertilizers so produced by a crop of cowpeas is to cut the vines for hay, returning the manure to the fields. A common practice is to plow under a crop at the end of the season, or sometimes to permit it to remain on the ground through the winter, both of which methods result in a loss of a very large part of the value of a crop through leaching. The best method, if the crop is turned under, is to at once plant a winter forage crop to cover the surface of the ground and so prevent washing by the winter rains. The cultivation of cowpeas has extended to California. Some of the varieties having a short season may be grown in the prairie region as far north as Iowa and Nebraska, and are there of considerable value for dairying purposes, because of their resistance to drought, furnishing on rich soil a palatable and nutritious food during the hottest and driest summer months.

Yucca baccata. Spanish bayonet; Bear grass.

A perennial of the Lily family, with stout, woody trunk several feet high, crowned at the top with a rosette of long sword-shaped leaves. Of no value as a forage plant except in seasons of drought, when the cattle and sheep on the ranges of Texas and Arizona, where it grows, eat the leaves, perhaps as much for the water which they contain as for food.

COMMON ENGLISH OR LOCAL NAMES OF FORAGE PLANTS.

[This list serves as an index to the Latin names, which are arranged alphabetically in the body of the work.]

Alexandrine Clover: *Trifolium alexandrinum.*
Alfalfa: *Medicago sativa.*
Alfilaria: *Erodium cicutarium.*
Alpine Clover: *Trifolium alpinum.*
Alsace Clover: *Trifolium hybridum.*
Alsike Clover: *Trifolium hybridum.*
Arabian Snail Clover: *Medicago maculata.*
Arrow Grass: *Triglochin maritimum.*
Artichoke: *Helianthus tuberosus.*
Asperect: *Onobrychis sativa.*
Australian Salt Bush: *Atriplex semibaccatum.*
Banana Field Pea: *Dolichos multiflorus.*
Banana Stock Pea: *Dolichos multiflorus.*
Bastard Clover: *Trifolium hybridum.*
Lucern: *Medicago media.*
Pod Clover: *Trifolium hybridum.*
Bear Grass: *Yucca baccata.*
Beckwith's Clover: *Trifolium beckwithii.*
Bee Clover: *Trifolium repens.*
Beggar Weed: *Desmodium tortuosum.*
Bellfountain: *Richardsonia scabra.*
Bersin Clover: *Trifolium alexandrinum.*
Big-headed Bog Rush: *Juncus nodosus.*
Weed: *Amaranthus.*
Birds-foot: *Ornithopus sativus.*
Clover: *Lotus corniculatus.*
Trefoil: *Lotus corniculatus.*
Bird Vetch: *Vicia cracca.*
Black Grass: *Juncus gerardi: Medicago lupulina.*
Medick: *Medicago lupulina.*
Nonesuch: *Medicago lupulina; Trifolium procumbens.*
Bladder Clover: *Trifolium fragiferum.*
Salt Bush: *Atriplex vesicarium.*
Blazing Star: *Liatris.*
Blood Clover: *Trifolium incarnatum.*
Blue Canada Field Pea: *Pisum arvense.*
Lupine: *Lupinus hirsutus.*
Bokhara Clover: *Melilotus alba.*
Bourgoyne: *Onobrychis sativa.*
Brabant Clover: *Trifolium pratense.*
Branching Clover: *Medicago sativa.*
Brazilian Clover: *Medicago sativa.*
Breast Clover: *Anthyllis vulneraria.*
Broad Bean: *Faba vulgaris.*
Clover: *Trifolium pratense.*
-leafed Clover: *Trifolium pratense.*
Brown Clover: *Trifolium procumbens; T. badium.*
Buckhorn Clover: *Trigonella fœnum-græcum.*
Buckwheat: *Fagopyrum esculentum.*
Buffalo Clover: *Astragalus caryocarpus; Trifolium reflexum.*
Pea: *Astragalus caryocarpus.*
Burnet Clover: *Poterium sanguisorba.*
Burnet or Burnette: *Poterium sanguisorba.*
Bur Clover: *Medicago denticulata; M. maculata.*
Bush Clover: *Lespedeza frutescens; L. striata.*
Lespedeza: *Lespedeza cyrtobotrya.*
Butterfly Pea: *Clitoria mariana.*
Butter Weed: *Erigeron canadensis.*
Button Snakeroot: *Liatris.*
Cabbage: *Brassica oleracea.*
Cabul Clover: *Melilotus alba.*
California Clover: *Medicago maculata.*
Canadian Field Pea: *Pisum arvense.*
Milk Vetch: *Astragalus canadensis.*
Careless Weed: *Amaranthus.*
Carnation Clover: *Trifolium incarnatum* (English).
Carob Bean: *Ceratonia siliqua.*
Tree: *Ceratonia siliqua.*
Carolina Clover: *Trifolium carolinianum.*
Cassava: *Manihot aipi.*
Cat Clover: *Anthyllis vulneraria; Trifolium arvense.*
Cat-in-clover: *Lotus corniculatus.*
Cherry Bean: *Vigna catjang.*
Chestnut-brown Clover: *Trifolium badium*
-colored Sedge: *Cyperus erythrorhizos.*
Chicken Vetch: *Vicia cracca.*
Chick Pea: *Cicer arietinum.*
Chicory: *Cichorium intybus.*
Chilian Clover: *Medicago sativa.*
China Grass Plant: *Bœhmeria nivea.*
Chinese Vetch: *Vigna catjang.*
Yam: *Dioscorea batatas.*
Chufa: *Cyperus esculentus.*
Cinquefoil: *Potentilla.*
Cloth Plant: *Bœhmeria nivea.*
Clover: *Trifolium pratense.*
of Roussillon: *Trifolium incarnatum.*
Trefoil: *Trifolium medium.*
Cocks-head: *Desmodium tortuosum; Onobrychis sativa.*
Coffee Bean: *Glycine hispida.*
Pea: *Cicer arietinum.*
Comfrey: *Symphytum asperrimum.*
Common Buckwheat: *Fagopyrum esculentum.*
Clover: *Trifolium repens; T. pratense.*
Field Bean: *Faba vulgaris.*
Kidney Vetch: *Anthyllis vulneraria.*
Red Clover: *Trifolium pratense.*
Common Spike Rush: *Eleocharis palustris.*
Vetch: *Vicia sativa.*
Wild Vetch: *Vicia americana.*
Corn Spurrey: *Spergula arvensis.*

Cow Clover: *Trifolium medium.*
Grass: *Trifolium medium.*
Horn: *Trigonella fœnum-græcum.*
Pea: *Vigna catjang.*
Cranes-bill: *Erodium moschatum.*
Creeping Bush Clover: *Lespedeza procumbens.*
Clover: *Trifolium repens.*
Kidney Bean: *Phaseolus diversifolius.*
Trefoil: *Trifolium repens.*
Crimson Clover: *Trifolium incarnatum.*
Cultivated Medick: *Medicago sativa.*
Dandelion: *Taraxacum dens leonis.*
Deer Brush: *Adenostoma sparsifolium.*
Weed: *Hosackia glabra.*
Dog Clover: *Melilotus officinalis.*
Door Weed: *Polygonum aviculare.*
Dooryard Grass: *Polygonum aviculare.*
Dwarf Essex Rape: *Brassica napus.*
Sedge: *Carex stenophylla.*
Duckweed: *Polygonum aviculare.*
Dutch Clover: *Trifolium repens.*
Early Clover: *Trifolium pratense.*
Maturing Soja Bean: *Glycine hispida.*
Earth Nut: *Arachis hypogæa.*
Egyptian Clover: *Trifolium alexandrinum; T. incarnatum.*
Elegant Clover: *Trifolium hybridum.*
Elliott's Sida: *Sida elliottii.*
Endives: *Cichorium endivium.*
English Clover: *Trifolium pratense.*
Esparcette: *Onobrychis sativa.*
Clover: *Onobrychis sativa.*
Esparsette: *Onobrychis sativa.*
Everlasting Pea: *Lathyrus polymorphus.*
Farouche: *Trifolium incarnatum* (French).
Fenugreek: *Trigonella fœnum-græcum.*
Field Clover: *Trifolium arvense; T. agrarium.*
Pea: *Pisum arvense; Vigna catjang.*
Filaree: *Erodium cicutarium.*
Filaria: *Erodium cicutarium.*
Fir Clover: *Anthyllis vulneraria.*
Five-finger: *Potentilla.*
Flat Pea: *Lathyrus sylvestris.*
Flesh-colored Clover: *Trifolium incarnatum.*
Florida Beggar Weed: *Desmodium tortuosum.*
Clover: *Richardsonia scabra; Desmodium tortuosum.*
Fodder Clover: *Medicago sativa.*
Forest Pea: *Lathyrus sylvestris.*
Fox Clover: *Trifolium rubens.*
Sedge: *Carex vulpinoidea.*
-tail Clover: *Trifolium rubens.*
French Clover: *Medicago sativa; Trifolium incarnatum.*
Honeysuckle: *Hedysarum coronarium.*
Lucern: *Medicago sativa.*
Furze: *Ulex europæus.*
Garden Pea: *Pisum sativum.*
German Clover: *Trifolium incarnatum.*
Mammoth Clover: *Trifolium incarnatum.*
Giant Clover: *Melilotus officinalis.*
Knotweed: *Polygonum sachalinense.*
Giant Sedge: *Carex aristata.*
Spurrey: *Spergula maxima.*
White Clover: *Trifolium hybridum.*
Glasswort: *Salicornia herbacea.*
Goat Clover: *Galega officinalis.*
Goatshorn: *Trigonella fœnum-græcum.*
Rue: *Galega officinalis.*
Gold-colored Clover: *Trifolium agrarium.*
Golden Clover: *Trifolium agrarium; T. filiforme; T. procumbens; T. badium.*
Golden Rod: *Solidago.*
Goober: *Arachis hypogæa.*
Pea: *Arachis hypogæa.*
Goosefoot: *Chenopodium.*
Goose Grass: *Polygonum aviculare.*
Gorse: *Ulex europæus.*
Gram: *Cicer arietinum.*
Gray Clover: *Trifolium arvense.*
Winter Pea: *Pisum arvense.*
Greasewood: *Sarcobatus vermicularis.*
Greek Hay: *Trigonella fœnum-græcum.*
Green Clover: *Trifolium medium.*
Ground Almond: *Cyperus esculentus.*
Nut: *Arachis hypogæa; Apios tuberosa.*
Gunaninpil: *Allionia incarnata.*
Hair Clover: *Trifolium arvense.*
Hairy Bush Clover. *Lespedeza polystachya.*
Prairie Clover: *Petalostemon villosus.*
Vetch: *Vicia villosa.*
Hall's Rush: *Scirpus hallii.*
Hard Clover: *Trifolium arvense.*
Haresfoot: *Trifolium arvense.*
Hareshead: *Onobrychis sativa.*
Hare's Little Paw: *Trifolium arvense.*
Hart's Clover: *Melilotus officinalis.*
Heart Clover: *Medicago maculata.*
Hemp Clover: *Melilotus officinalis; M. alba.*
Hog Nut: *Cyperus esculentus.*
Peanut: *Amphicarpia monoica.*
Honey Locust: *Gleditschia triacanthos.*
Honeysuckle: *Hedysarum coronarium.*
Clover: *Trifolium repens.*
Grass: *Trifolium repens.*
Hoop-koop: *Lespedeza striata.*
Hop Clover: *Medicago lupulina; Trifolium procumbens; T. agrarium.*
Snail Clover: *Medicago lupulina.*
Horned Clover: *Lotus corniculatus.*
Horse Bean: *Faba vulgaris.*
Clover: *Melilotus officinalis; M. alba.*
Weed: *Erigeron canadensis.*
Horse-shoe Vetch: *Hippocrepis comosa.*
Huajillo: *Pithecolobium brevifolium.*
Hungarian Clover: *Trifolium pannonicum.*
Hybrid Clover: *Trifolium hybridum.*
Ipecac Weed: *Richardsonia scabra.*
Italian Clover: *Trifolium incarnatum.*
Japan Bush Clover: *Lespedeza cyrtobotrya.*
Clover: *Lespedeza striata.*
Japanese Buckwheat: *Fagopyrum esculentum.*
Jesuit's Tea: *Psoralea glandulosa.*
June Clover: *Trifolium pratense.*
Kidney Vetch: *Anthyllis vulneraria.*
King Grass: *Lespedeza striata.*
King's Clover: *Melilotus officinalis.*
Knotweed: *Polygonum aviculare.*
Lady's Finger: *Anthyllis vulneraria.*
Lamb Clover: *Trifolium repens.*
Lamb's Quarters: *Chenopodium album.*
Lamb's Tail: *Trifolium arvense.*

Large American Clover: *Trifolium medium.*
Golden Clover: *Trifolium agrarium.*
White Clover: *Melilotus alba.*
Late-fruited Sedge: *Carex retrorsa.*
Leafy Prairie Clover: *Petalostemon foliosus.*
Lentil: *Errum lens.*
Lentil Tare: *Vicia tetrasperma.*
Vetch: *Vicia tetrasperma.*
Lesser Clover: *Trifolium procumbens.*
Little Yellow Hop Clover: *Trifolium filiforme.*
Long Moss: *Tillandsia usneoides.*
-stalked Kidney Bean: *Phaseolus helvolus.*
Louisiana Vetch: *Vicia ludoviciana.*
Low Hop Clover: *Trifolium procumbens.*
Lucern: *Medicago sativa.*
Medicago: *Medicago sativa.*
Lupine: *Lupinus albus; L. luteus; L. perennis.*
Madder: *Rubia tinctoria.*
Maltese Clover: *Hedysarum coronarium.*
Mammoth Clover: *Trifolium medium.*
Manured Medick: *Medicago sativa.*
Marl Grass: *Trifolium pratense; T. medium.*
Mayad Clover: *Trifolium subrotundum.*
Meadow Pea: *Lathyrus pratensis.*
Rush: *Scirpus atrovirens.*
Medick: *Medicago sativa.*
Bur: *Medicago denticulata.*
Clover: *Medicago denticulata.*
Vetchling: *Onobrychis sativa*
Medium Clover: *Trifolium medium.*
Red Clover: *Trifolium pratense.*
Melilot Clover: *Melilotus officinalis.*
Mesquite Tree: *Prosopis juliflora.*
Mexican Clover: *Medicago sativa; Richardsonia scabra.*
Milk Pea: *Galactia pilosa.*
Milfoil: *Achillea millefolium.*
Modiola: *Modiola decumbens.*
Mouse Clover: *Trifolium arvense.*
Narrow-fruited Sedge: *Carex sychnocephala.*
Native Red Clover: *Trifolium pratense.*
New Zealand Spinach: *Tetragonia expansa.*
Nigger Head: *Carex.*
Wool: *Carex.*
Nonesuch: *Medicago lupulina.*
Nopal: *Opuntia engelmanni.*
Old Sow: *Trigonella fœnum-græcum.*
Pea: *Pisum arvense; Vigna catjang.*
Peanut: *Arachis hypogæa.*
Pea Vine Clover: *Trifolium medium.*
Pennsylvanian Clover: *Trifolium reflexum.*
Perennial Hybrid Clover: *Trifolium hybridum.*
Red Clover: *Trifolium medium.*
Piedmont Clover: *Trifolium pratense.*
Pigeon Weed: *Richardsonia scabra.*
Pigweed: *Amaranthus; Chenopodium.*
Pin Clover: *Erodium cicutarium.*
Grass: *Erodium cicutarium.*
Weed: *Erodium cicutarium.*
Plantain: *Plantago lanceolata.*
Herb: *Plantago lanceolata.*
Plaster Clover: *Melilotus officinalis.*
Pomme Blanche: *Psoralea esculenta.*
de Prairie: *Psoralea esculenta.*
Poor Toe: *Richardsonia scabra.*
Prairie Clover: *Petalostemon candidus; P. violaceus.*
Prairie Turnip: *Psoralea esculenta.*
Prickly Comfrey: *Symphytum asperrimum.*
Pear: *Opuntia engelmanni.*
Purple Bush Clover: *Lespedeza violacea.*
Clover: *Trifolium pratense.*
Medick: *Medicago sativa.*
Prairie Clover: *Petalostemon violaceus.*
Purslane: *Portulaca oleracea.*
Pusley: *Portulaca oleracea.*
Pussywort: *Trifolium arvense.*
Rabbit-foot Clover: *Trifolium arvense.*
Ramie: *Bœhmeria nivea.*
Ram's Horn: *Cicer arietinum.*
Rape: *Brassica napus.*
Rattle Pod: *Astragalus hypoglottis.*
Red Clover: *Trifolium pratense.*
Reddish Clover: *Trifolium rubens.*
Red Dutch Clover: *Trifolium pratense.*
Hare Clover: *Trifolium rubens.*
Meadow Clover: *Trifolium pratense.*
Redtop Clover: *Trifolium pratense.*
Reversed Clover: *Trifolium resupinatum.*
Rib Grass: *Plantago lanceolata.*
Herb: *Plantago lanceolata.*
Ripple Grass: *Plantago lanceolata.*
River Club Rush: *Scirpus fluviatilis.*
Round-headed Bush Clover: *Lespedeza capitata.*
Snail Clover: *Medicago orbicularis.*
Running Buffalo Clover: *Trifolium stoloniferum.*
Clover: *Trifolium stoloniferum.*
Russian Vetch: *Vicia villosa.*
Sacaline: *Polygonum sachalinense.*
Sachaline: *Polygonum sachalinense.*
Sage Brush: *Atriplex canescens.*
Saghalin Polygonum: *Polygonum sachalinense.*
Sainfoin: *Onobrychis sativa.*
St. John's Bread: *Ceratonia siliqua.*
St. Mawe's Clover: *Medicago maculata.*
Salad Burnet: *Poterium sanguisorba.*
Saleratus Weed: *Salicornia herbacea.*
Salt Bush: *Atriplex semibaccatum.*
Salt Bush No. 2: *Atriplex leptocarpum.*
Samphire: *Salicornia herbacea.*
Sand Clover: *Anthyllis vulneraria.*
Spurrey: *Spergula arvensis.*
Vetch: *Vicia villosa.*
Sanfoin: *Onobrychis sativa.*
Sapling Clover: *Trifolium medium.*
Scarlet Clover: *Trifolium incarnatum.*
Scented Yellow Lupine: *Lupinus luteus.*
Scotch Broom: *Genista scoparia.*
Screw Bean: *Prosopis juliflora; P. pubescens.*
Sea Club Rush: *Scirpus maritimus.*
Seaside Arrow Grass: *Triglochin maritimum.*
Sensitive Brier: *Schrankia.*
Sensitive Plant: *Schrankia uncinata; S. angustata.*
Serradella: *Ornithopus sativus.*
Seven Seed: *Trigonella fœnum-græcum.*
Shad Scale: *Atriplex canescens; A. confertifolia.*
Shamrock: *Trifolium repens; Medicago lupulina.*
Clover: *Trifolium procumbens.*
Sheep Clover: *Trifolium repens.*
Sherman's Clover: *Lespedeza striata.*
Silver Hull Buckwheat: *Fagopyrum esculentum.*
Silvery-topped Sedge: *Carex siccata.*

Slender Bog Rush: *Juncus tenuis.*
-fruited Saltbush: *Atriplex leptocarpum.*
-stalked Clover: *Trifolium filiforme.*
Small-flowered Clover: *Trifolium filiforme.*
Vetch: *Vicia micrantha.*
Red Clover: *Trifolium pratense.*
Smartweed: *Polygonum.*
Smooth Milk Pea: *Galactia glabella.*
Snail Clover: *Medicago turbinata.*
Soiling Clover: *Trifolium medium.*
Soja Bean: *Glycine hispida.*
Soola Clover: *Hedysarum coronarium.*
Sotol: *Dasylirion texanum.*
Southern Cowpea: *Vigna catjang.*
Soy Bean: *Glycine hispida.*
Spanish Bayonet: *Yucca baccata.*
Clover: *Trifolium pratense; Richardsonia scabra.*
Moss: *Tillandsia usneoides.*
Peanut: *Arachis hypogæa.*
Sainfoin: *Hedysarum coronarium.*
Trefoil: *Medicago sativa.*
Spotted Clover: *Galega officinalis.*
Medick: *Medicago maculata.*
Spring Vetch: *Vicia sativa.*
Spurred Butterfly Pea: *Centrosema virginianum.*
Spurrey: *Spergula arvensis.*
Square Pod Pea: *Lotus tetragonolobus.*
Stock Pea: *Vigna catjang.*
Stone Clover: *Medicago falcata; Trifolium arvense.*
Storksbill: *Erodium cicutarium.*
Straight Bean: *Faba vulgaris.*
Strawberry Clover: *Trifolium fragiferum.*
-headed Trefoil: *Trifolium fragiferum.*
Straw-colored Sedge: *Carex straminea.*
Succulent Clover: *Trifolium pratense.*
Suckling Clover: *Trifolium filiforme.*
Sulla: *Hedysarum coronarium.*
Sulphur Clover: *Trifolium ochroleucum.*
Summer Lentil: *Ervum lens.*
Sunflower: *Helianthus annuus.*
Sunn: *Crotalaria juncea.*
Hemp: *Crotalaria juncea.*
Swamp Horn Clover: *Lotus uliginosus.*
Swedes: *Brassica napus.*
Swedish Clover: *Trifolium hybridum.*
Turnips: *Brassica napus.*
Sweet Cassava: *Manihot aipi.*
Clover: *Melilotus alba.*
Potato: *Convolvulus edulis.*
Sage: *Eurotia lanata.*
scented Clover: *Melilotus alba.*
Trefoil: *Lotus corniculatus.*
Tagasaste: *Cytisus proliferus albus.*
Tares: *Vicia sativa.*
Tarweed: *Madia sativa.*
Thread Clover: *Trifolium filiforme.*
Tick Trefoil: *Desmodium canadense.*
Toothed Medick: *Medicago denticulata.*
Tornillo: *Prosopis pubescens.*
Tree Clover: *Melilotus alba.*
Trigonel: *Trigonella fœnum-græcum.*
Tufted Spike Rush: *Eleocharis obtusa.*
Tula Grass: *Cyperus strigosus.*
Tule: *Cyperus strigosus.*
Tumbleweed: *Amaranthus.*
Turkestan Alfalfa: *Medicago sativa.*
Turkish Clover: *Trifolium pratense.*
Upright Knotweed: *Polygonum erectum.*
Sedge: *Carex stricta.*
Velvet Bean: *Dolichos multiflorus.*
Vetch: *Vicia sativa.*
Violet Clover: *Lespedeza violacea.*
Water Grass: *Carex; Eleocharis; Scirpus; Cyperus. Carex muricata.*
Parsley: *Richardsonia scabra.*
Welsh Clover: *Trifolium arvense.*
West Indian Honeysuckle: *Desmodium.*
Whin: *Ulex europæus.*
White Bokhara Clover: *Melilotus alba.*
Canada Field Pea: *Pisum arvense.*
Clover: *Trifolium repens.*
Dutch Clover: *Trifolium repens.*
Giant Clover: *Melilotus alba.*
Lupine: *Lupinus albus.*
Meadow Trefoil: *Trifolium repens.*
Prairie Clover: *Petalostemon candidus.*
Sage: *Atriplex confertifolia; Eurotia lanata.*
Swedish Clover: *Trifolium hybridum.*
Trefoil: *Trifolium repens.*
Wild Buckwheat: *Polygonum.*
Kidney Bean: *Phaseolus perennis.*
Laburnum: *Melilotus officinalis.*
Vetch: *Hosackia purshiana.*
Winter Fat: *Eurotia lanata.*
Flat Pea: *Lathyrus cicer.*
Lentil: *Ervum lens.*
Rape: *Brassica napus.*
Vetch: *Lathyrus hirsutus; Vicia villosa.*
Wonder Clover: *Melilotus alba.*
Wood Pea: *Lathyrus sylvestris.*
Vetch: *Vicia sylvatica.*
Wound Clover: *Anthyllis vulneraria.*
Wort: *Anthyllis vulneraria.*
Yam: *Dioscorea batatas.*
Yarrow: *Achillea millefolium.*
Yellow Clover: *Trifolium procumbens; T. agrarium; T. minus; Lotus corniculatus; Medicago lupulina.*
Hop Clover: *Trifolium agrarium.*
Lucern: *Medicago falcata; M. lupulina.*
Lupine: *Lupinus luteus.*
Meadow Trefoil: *Trifolium agrarium.*
Moon Trefoil: *Medicago falcata.*
Sand Trefoil: *Anthyllis vulneraria.*
Suckling Clover: *Trifolium filiforme.*
Sweet Clover: *Melilotus officinalis.*
Trefoil: *Lotus corniculatus.*
Zigzag Clover: *Trifolium medium.*

BULLETIN No. 3.

U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF AGROSTOLOGY.

GRASS AND FORAGE PLANT INVESTIGATIONS.

USEFUL AND ORNAMENTAL GRASSES.

BY

F. LAMSON-SCRIBNER,

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WASHINGTON:

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF AGROSTOLOGY,
Washington, D. C., July 15, 1896.

SIR: I submit herewith for publication as a bulletin of this Division an enumeration of the true grasses useful for food, for hay, for pastures, for lawns, for ornament, for paper making, etc., both of this and other countries. The different kinds are arranged in alphabetical order by the initial letter of their Latin names. There is appended a list of the common or local English names of all the grasses enumerated, so far as I have been able to obtain them. These English names are arranged alphabetically, the Latin equivalent being given in each case, under which the grass is described. There is much confusion in the use of English names for grasses. Many of these names are purely local, and oftentimes the same grass is known in one locality by one name and in another section by another. In parts of the South "blue grass" is applied to any native pasture grass which has a good, luxuriant growth and is readily eaten by stock. It is most commonly applied, however, to *Poa pratensis*, or "Kentucky blue grass." This grass is called "green grass" by some in Pennsylvania, and "spear grass" or "June grass" by many in New England. In Australia "blue grass" is applied to a species of *Andropogon*. In the West and in the Rocky Mountain region we have the names "bunch grass" and "buffalo grass," each applied indiscriminately to several species. The term "bunch grass" is applied to a great number of kinds which grow in bunches and do not make a continuous sod. In Montana the name "buffalo grass" is applied to *Bouteloua oligostachya*, and in Australia *Stenotaphrum americanum* is called "buffalo grass." In the Southwest the several species of Bouteloua are called grama. This term is also applied to other grasses, being somewhat generic in character and employed to designate any good grazing grass which becomes gray with age. Very many of the species of grasses of the Northwest which are of undoubted agricultural value have received no popular English names, and I have not included them in this enumeration. There are many species of Agrostis, of Festuca, and particularly of Poa, growing

wild upon the Pacific Slope of the Northwest or in the Rocky Mountain region which are doubtless as valuable for grazing or for hay as any of the species I have included, but our present information regarding them is rather botanical than economic, the observers or collectors being more given to science than to agriculture, so that I have omitted them, awaiting more definite information respecting their economic value and agricultural merit, either in their natural growth or under cultivation. These grasses, and others which may have been overlooked, can be included in a future edition, should such a publication be deemed desirable.

Respectfully,

F. LAMSON-SCRIBNER,
Chief of Division of Agrostology.

Hon. CHAS. W. DABNEY, JR.,
Assistant Secretary of Agriculture.

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INTRODUCTION.

There are nearly 4,000 distinct species of grasses distributed through out the world, and 1,400, or one-third of the entire number, are natives of North America. North of Mexico there are over 700 species, with more than 100 varieties. Six hundred and fifty species have been collected in Mexico alone. These grasses are not all equally useful. Some of them appear to be worthless, and a number are harmful to agriculture by possessing the character of weeds or by yielding injurious products. Some of them have a very restricted range and are found but rarely. A few are limited to the Arctic zone, or are confined to the highest mountain tops near the limits of perpetual snow; others grow only within the tropics, while still others are found in temperate climates. Some grow in the sands along the seacoasts, some flourish only in moist meadows, and others exist in the most arid deserts; some grow in the shadows of forests, others thrive only upon open plains; some are confined to soils heavily charged with lime, others make vigorous growth where practically no lime exists. It is with all the varied peculiarities of grasses—their individual characteristics, the soils and surroundings best suited to their growth, their productiveness and palatability—that one must become familiar in order to direct his efforts intelligently in the improvement of the forage and grazing resources of the country, the prime feature of interest that the farmer has in the subject.

In the following pages an attempt is made to point out the more important grasses, briefly stating their characters and qualities. It may be helpful to present here a list of these, classified according to their uses:

Narcotic or poisonous.—Lolium temulentum;* Panicum antidotale (India); Paspalum scrobiculatum (India); Stipa viridula.

Medicine.—Agropyron repens; Andropogon iwarancusa; A. laniger; A. nardus; A. schœnanthus; A. squarrosus; Arundo donax; Coix lachryma; Dactyloctenium ægyptiacum; Eragrostis cynosuroides; Gynerium argenteum; Hilaria cenchroides; Panicum antidotale (India); Paspalum notatum; Thysanolæna acarifera.

Distilled and malt liquors.—Avena sativa (Russia); Hordeum sativum; Oryza sativa; Saccharum officinarum; Secale cereale; Zea mays.

*See Lolium temulentum under Lolium in body of work.

For lawns.—Agrostis canina; A. stolonifera; Alopecurus geniculatus; Buchloë dactyloides; Chloris verticillata (Southwest); Cynodon dactylon (in the South); Cynosurus cristatus; Festuca heterophylla; Opizia stolonifera (Mexico); Paspalum platycaule (South); Poa compressa; P. pratensis; P. nemoralis; Stenotaphrum americanum (South); Thuarea sarmentosa (in the tropics); Zoysia pungens.

Hay.--Agropyron divergens; A. spicatum (in the West); Agrostis alba; Alopecurus pratensis; Andropogon bombycinus (Australia); A. halepensis (South); A. nutans (West); A. provincialis (West); Anthistiria avenacea (Australia); Arrhenatherum elatius; Astrebla pectinata (Australia); Avena sativa (Pacific Slope and South); Bouteloua oligostachya and B. racemosa (in the West); Brachypodium japonicum (Pacific Coast and South); Bromus inermis (South and West); B. pumpellianus (Northwest); B. unioloides (South); Calamagrostis canadensis (Middle and Northern States); Cynodon dactylon (in the South); Dactylis glomerata; Elymus condensatus (Pacific Coast); Eragrostis abyssinica (South); Festuca duriuscula; F. elatior; Hilaria rigida (Southwest); Koeleria cristata (West); Lolium italicum; L. perenne; Muhlenbergia distichophylla (Southwest); Oryzopsis membranacea; Panicum crus-galli; P. miliaceum; P. molle (South); P. proliferum; P. sanguinale (South); P. spectabile (tropics); P. texanum (Southwest); Pennisetum cenchroides (in the Orient); Phleum pratense; Poa nemoralis; Setaria italica; Sporobolus indicus (Australia); S. wrightii (Southwest); Tricholæna rosea (Australia); Trisetum pratense.

Cereal grasses—Andropogon montanus (India); A. sorghum sativus; Arundinaria hookeriana (India); Astrebla pectinata (Australia); Avena sativa; Coix lachryma; Dactyloctenium ægyptiacum (India and southern California); Eleusine coracana (the Orient); Eragrostis abyssinica (Africa); Glyceria fluitans; Hordeum sativum; Ischæmum rugosum (India); Oryza sativa; Oryzopsis membranacea (New Mexico); Panicum colonum (India); P. crus-galli (southern California); P. flavidum (India); P. frumentaceum (India); P. miliaceum; P. sanguinale (Bohemia); P. turgidum (Egypt); Phalaris canariensis; Secale cereale; Setaria italica; Triticum polonicum; T. sativum; Zea mays; Zizania aquatica.

Soiling.—Andropogon sorghum sativus; Euchlæna mexicana (South); Panicum colonum (tropics); Pennisetum spicatum (Southern States); Saccharum officinarum; Zea mays.

Fiber.—Eragrostis cynosuroides; Ischæmum angustifolium; Saccharum ciliare; Stipa tenacissima; Lygeum spartum; Spartina cynosuroides; several species of Bamboo.

Edible.—Arundinaria wightiana (India); Bambusa; Zea mays.

Desert grasses.—Blepharidachne; Elionurus hirsutus (northern India); Hilaria cenchroides; H. jamesii; H. rigida; Triraphis mollis.

Grasses for alkaline and saline soils.—Distichlis maritima; Sporobolus airoides; S. asperifolius; S. orientalis.

Ornamental grasses.—Agrostis nebulosa; A. scabra; Aira elegans; Arundo donax; Asprella hystrix; Briza maxima; B. media; Chloris barbata; Coix lachryma; Desmazeria sicula; Eragrostis ciliaris; E. pectinacea; Erianthus ravennæ; E. saccharoides; Festuca glauca; Gastridium australe; Glyceria canadensis; Gynerium argenteum; Lagurus ovatus; Lamarckia aurea; Miscanthus sinensis; Muhlenbergia capillaris; Oplismenus; Panicum plicatum; P. sulcatum; Pappophorum laguroideum; Pennisetum japonicum; P. latifolium; P. violaceum; Stipa elegantissima; S. pennata; Trichloris blanchardiana; Tricholæna rosea; Triraphis mollis; Uniola latifolia; U. paniculata.

Grasses used in paper-making.—Arundinaria; Avena sativa; Bambusa; Calamovilfa longifolia; Danthonia flavescens and D. raoulii (New Zealand); Festuca littoralis; Gynerium argenteum; Ischæmum angustifolium; Lygeum spartum; Oryza sativa; Poa cæspitosa; Saccharum ciliare; S. officinarum; Secale cereale; Setaria viridis; Spartina cynosuroides; S. gracilis; Stipa tenacissima; Zea mays.

Grasses for pastures.—Agrostis alba; A. stolonifera; Andropogon affinis (Australia); A. saccharoides (Chile); Bouteloua oligostachya and B. racemosa (in the West); Buchloë dactyloides (West); Chloris verticillata (Southwest); Cynodon dactylon (in the South); Epicampes rigens (Southwest); Eriochloa punctata (South); Festuca heterophylla; F. ovina; F. rubra; F. scabrella (Rocky Mountains); Opizia stolonifera (Mexico); Panicum jumentorum (South and in the tropics); P. serotinum (South); Paspalum dilatatum (in the South); P. platycaule (South); Poa arachnifera (South); P. compressa; P. flabellata (Falkland Islands); P. nemoralis; P. pratensis; P. trivialis; Pollinia fulva (Australia); Stenotaphrum americanum (South); Triodia exigua.

Salt marsh hay.—Chloris glauca (in the South); Glyceria maritima; Spartina cynosuroides; S. juncea; S. stricta.

Sand binders.—Ammophila arenaria (coast); Calamovilfa longifolia (interior); Elymus arenarius (coast); E. mollis (coast); Imperata arundinacea (coast, in the tropics, and Southern States); Muhlenbergia pungens (interior); Panicum amarum (coast); P. repens (coast); Paspalum distichum (in the South); Redfieldia flexuosa (interior); Spinifex hirsutus (coast, Australia); Stenotaphrum americanum (coast, South); Thuarea sarmentosa (in the tropics); Uniola paniculata (coast, in the South); Zoysia pungens (coast, southern Asia, Australia).

Soil binders (used to prevent the washing of river banks, railroad embankments, dams, etc.).—Andropogon contortus; A. halepensis; Bromus inermis; Deschampsia cæspitosa; Distichlis maritima; Elymus condensatus (Pacific Coast); Holcus mollis (Germany); Imperata arundinacea (in the tropics and Southern States); Isachne australis (tropics); Oryzopsis membranacea; Panicum curtisii (in the South); P. virgatum (interior); Phalaris arundinacea (interior); Phragmites communis; Pollinia fulva (Australia); Spartina cynosuroides.

Sweet-scented grasses.—Andropogon laniger; A. nardus; A. scnœnanthus; A. squarrosus; Anthoxanthum odoratum; Hierochloe odorata.

Weeds.—Agropyron repens; Agrostis scabra; Alopecurus agrestis; Andropogon halepensis; A. virginicus; Arrhenatherum elatius (New Zealand); Avena fatua; Bromus mollis; B. secalinus; Cenchrus echinatus; C. tribuloides; Dactyloctenium ægyptiacum (in the South); Danthonia spicata (New England); Eleusine indica (South); Eragrostis major; Hordeum jubatum; H. murinum; Oryzopsis membranacea; Panicum capillare; P. crus-galli; P. proliferum; P. sanguinale; Setaria glauca; S. verticillata; S. viridis; Sporobolus indicus (in the South).

In the arts and manufactures.—Andropogon sorghum sativus; A. contortus; A. squarrosus; Aristida setacea; Arundinaria gigantea; Arundo donax; Bambusa species; Panicum junceum; Phalaris canariensis; Poa pratensis; Saccharum ciliare; S. officinarum; Secale cereale; Zizania aquatica.

F. L. S.

July 15, 1896.

Agropyron caninum R. & S. Bearded Wheat-grass; Awned Wheat-grass; Fibrous-rooted Wheat-grass.

A fibrous-rooted, rather slender, upright grass, 2 to 3 feet high, with bearded nodding heads or spikes resembling slender heads of wheat. This grass is more or less frequent in the northern parts of the United States, ranging from Maine to South Dakota. Bearded Wheat-grass is closely related to the more common and better known Couch-grass (*A. repens*), but differs markedly from that species in having no creeping rootstocks, and in the longer beards or awns to the spikelets. No attempts have been made to introduce this grass into general cultivation, but its habit of growth and general character indicate that it may possess considerable agricultural value. It is readily propagated by seeds, which may be easily gathered. *Agropyron richardsoni* Schrad. (*A. unilaterale* V. & S.) a closely allied species is abundant in the Rocky Mountain region, where it occasionally forms a considerable portion of the herbage of the "mountain parks.

Agropyron divergens Nees. Wire Bunch-grass; Apache Blue-grass (New Mexico); Wiry Wheat-grass.

A slender, usually densely tufted grass, 1 to 2 feet high or more, with very narrow, spreading leaves, and bearded or beardless spikes. The beards or awns, when present, are widely spreading or divergent. This grass is common in the Rocky Mountain and Pacific Slope regions, extending westward to the coast. On rich lands it often grows to the height of 3 feet, but upon the dry bench lands it rarely exceeds a foot or 18 inches in height. On dry lands the stems become wiry with age, and are avoided by stock; but the grass is considered valuable by the ranchmen for winter grazing. Samples of this grass received from some points in the West, particularly from Washington, indicate that it possesses much agricultural value when grown upon good soil, and as it will thrive in the semiarid regions of the Northwest, its cultivation may prove desirable. Propagated readily by seed, which can be easily gathered.

Agropyron glaucum Am. Auct. (See *Agropyron spicatum*.)

Agropyron japonicum. (See *Brachypodium japonicum*.)

Agropyron repens Beauv. Couch-grass; Witch-grass; Quitch-grass; Quick-grass; Quack-grass; Quake-grass; Wheat-grass; Creeping Wheat-grass; Dog-grass; Dutch-grass; Durfa-grass; Durfee-grass; Devil's-grass; Chandler's-grass; Scutch-grass; Twitch-grass; Fin's-grass. (Fig. 1.)

A grass abundant everywhere in the Eastern and Middle States, growing in the open fields, and in many places it has become one of the worst of weeds. Often the chief labor in managing hoed crops consists in subduing this pest. When once established, it is hardly less difficult to eradicate than the well-known Johnson-grass of the Southern States. It is, however, a valuable hay grass, and for two or three years the yield is large, but, like the Western Blue-stem, it "binds itself out," and the sod requires breaking in order to restore the yield. It is

an excellent grass for binding railroad and other embankments subject to wash, and can be recommended for this purpose. The roots are well known in medicine under the name of *Radix graminis*. The simple infusion is used as a diuretic. Propagated by "root cuttings" or by seed.

Agropyron repens var. glaucum Am. Auct. (See *Agropyron spicatum*.)

Agropyron spicatum Scribn. & Smith. Colorado Blue-stem; Blue-joint; Blue-stem; Blue-grass; Wheat-grass; Wild Quack-grass; Gumbo-grass.

A grass closely resembling the Couch-grass of the Eastern States, and by some regarded as only a variety of it. It has the same strong and extensively creeping rootstocks, and the foliage and spikes are very similar, but the whole plant usually has a bluish color, whence the common name "Blue-stem," most frequently applied to it in the West. It grows naturally on the dry bench lands and river bottoms; and, although the yield per acre is not large, the quality of the hay is unsurpassed by any other species of the region where it grows. In Montana and the neighboring States it furnishes a considerable amount of native hay, and is there regarded as one of the most important of the native forage plants. After three or four successive annual cuttings, the yield diminishes very much, but the grass is "brought up" by letting it stand a year or two, or by dragging over the sod a sharp-toothed harrow, thus breaking the roots into small pieces, every fragment of which makes a new plant. This grass is quite distinct from the "Blue-stem" grasses of Nebraska, which are species of *Andropogon* (*A. provincialis*). There are a number of native species of Agropyrons or wheat-grasses in the Rocky Mountains, some of which are evidently excellent hay grasses and could be introduced into cultivation to advantage.

FIG. 1—Couch-grass. (*Agropyron repens.*)

FIG. 2.—Red-top. (*Agrostis alba.*)

Agrostis alba Linn. Herd's-grass; Bent-grass; English Bent; White Bent; Bonnet-grass; White-top; Dew-grass; Fiorin; Marsh Bent-grass. (Fig. 2.)

Under the botanical name of *Agrostis alba* are included a number of varieties, some of which have received distinct Latin names; as, for example, *Agrostis vulgaris* and *Agrostis stolonifera*, and many English or local names, that most generally applied in the Middle and Eastern States being Herd's-grass, and in the South, Red-top. The great variability of this grass has led to a considerable diversity of opinion in regard to its value. The taller forms are largely cultivated for hay, being usually mixed with timothy and clover. This grass requires considerable moisture in the soil, and is one of the best for permanent

pastures in the New England and Middle States. It makes a very resistant and leafy turf, which well withstands the trampling of stock. It grows well, also, as far south as Tennessee. Among the forms of low growth are two varieties which are unsurpassed, either in fineness or richness of color, for making lawns.

Agrostis asperifolia Trin. Rough-leaved Bent.

This grass is common in the Rocky Mountain regions and on the Pacific Slope, growing chiefly in the mountain parks and along water courses. Its slender leafy culms are 2 to 3 feet high, and the narrow, pale-green, and densely flowered panicle 4 to 6 inches long. Judging from the appearance of this grass, it is likely to prove, under cultivation, superior to the Herd's-grass or Red-top of the East, at least for hay.

Agrostis arachnoides Ell. Spider Bent-grass.

This is a low, slender grass, common on dry, thin soils in the Southern States. It rarely exceeds a foot in height, and is of no agricultural value.

Agrostis canina Linn. Brown Bent; Dog's Bent; Mountain Red-top; Rhode Island Bent; Fine-top; Furze-top; Burden's-grass.

This species of bent has been introduced into this country from Europe, and is cultivated to some extent in the Eastern States. It resembles Herd's-grass (Red-top) somewhat, but has much finer root leaves. It makes a close sod, and is considered valuable for permanent meadows and pastures. It is one of the best grasses for lawns, and for this purpose should be sown at the rate of 3 to 4 bushels per acre. Retail price of seed quoted in New York catalogues, $2.75 per bushel.[1]

Agrostis elata Trin. Southern Bent; Tall Thin-grass.

An upright, leafy grass, 2 to 3 feet high, with spreading panicles, frequenting swamps and low grounds in the Middle and Southern States. It is a perennial, coming into flower in the late summer and autumn months. Although no attempts have been made to cultivate it, its habit of late blooming may recommend it for mixtures designed for permanent pastures in locations adapted to its growth. It is always found growing with other grasses and does not form a turf by itself.

Agrostis elegans. Name applied by florists to *Aira elegans* and *Aira caryophyllea.*

Agrostis exarata Trin. Northern Red-top; Mountain Red-top.

Under *Agrostis exarata* have been included a number of forms of Bent-grass, which occur in the Rocky Mountain regions and on the Pacific Slope. Some of these have been characterized as distinct species, and there are several among them which, from their tall, leafy habit and vigorous growth, indicate the possession of considerable agricultural value, although none of them have as yet been introduced into cultivation. They are deserving of the attention of the agriculturist, and their culture is recommended, particularly on the Pacific Slope. They would doubtless thrive in the Eastern and Middle States, and possibly supplant, by their greater luxuriance and better qualities, some of the species now cultivated.

Agrostis hiemalis. (See *Agrostis scabra.*)

Agrostis nebulosa Boiss. & Reut.

A low grass with extremely delicate panicles of small spikelets. Frequently cultivated for dry bouquets. Native of Spain. Of no agricultural value.

Agrostis perennans Tuck. Thin-grass.

This is a weak, decumbent grass, 1 to 2 feet long or less, with numerous leaves, and open, few-flowered panicles. It is found in swamps and moist woodlands in the

[1] The prices of grass seed are subject to wide variation. With the standard seeds this variation depends chiefly upon the amount and quality of the season's supply.

Middle and Southern States, and in such places furnishes a moderate amount of native fodder of good quality. It may prove a valuable grass for cultivation under the shade of trees where the soil is not too dry.

Agrostis pulchella. (See *Agrostis elegans.*)

Agrostis scabra Willd. Rough Bent; Fly-away-grass; Tickle-grass; Hair-grass; Fool-hay; Silk-grass.

A slender, erect, tufted annual, with numerous very narrow basal leaves, and delicate, widely spreading capillary panicles, which at maturity break away from the culm, and are blown about by the wind, hence one of the common names, "fly-away-grass." Before the panicle has expanded, this grass is sometimes gathered in the vicinity of large towns and sold under the name of "silk-grass" for dry bouquets. It is widely distributed throughout the United States, in the Middle and Southern States coming into bloom in April and May. It possesses little or no agricultural value.

Agrostis stolonifera Linn. Creeping Bent; Fiorin.

A variety of *Agrostis alba*, with long, prostrate or creeping stems, well adapted for sandy pastures near the coast, and useful, perhaps, for binding shifting sands or river banks subject to wash or overflow. It makes a good pasture grass for low lands, especially for those which are somewhat sandy, and produces a fine and enduring turf for lawns. It has a record of yielding on rich, peaty soil 7,742 pounds of hay and 2,722 pounds of green aftermath per acre. If sown alone, sow at the rate of 2 bushels per acre, or for lawns 3 bushels. Current retail price in New York, $3.30 per bushel.

FIG. 3.—Floating Foxtail. (*Alopecurus geniculatus.*)

Agrostis vulgaris With. Herd's-grass; Bent; Fine-top; Fine Bent; Rhode Island Bent; Furze-top; Tall Red-top; Burden's-grass; Red-top; Summer Dew-grass; Borden's-grass.

This is little more than a variety of *Agrostis alba*, already noted. It is quoted in the seed catalogues as a distinct species, and is recommended for mixtures designed for permanent pastures or meadows. It succeeds as far south as Tennessee, and is often sown with timothy and red clover. Retail price of seed, New York market, $1.25 to $1.50 per bushel.

Aira cæspitosa. (See *Deschampsia cæspitosa.*)

Aira elegans Gaud.

A slender, erect, and very pretty annual, from a few inches to a foot high, with widely spreading, capillary panicles of many small spikelets. Cultivated for dry bouquets. This and the more common *Aira caryophyllea*, which has become spontaneous on dry, sandy soils in many places in the Middle States, are generally known to florists under the name of *Agrostis elegans*.

Aira præcox Linn. Early Wild Oat-grass.

A low, tufted annual, 3 to 4 inches high, which has been introduced into this country from Europe, and is occasionally found in sandy fields in the Middle States. It has no agricultural value.

Alopecurus agrestis Linn. Slender Foxtail.

A slender annual, 1 to 2 feet high, closely related to and somewhat resembling in appearance Meadow Foxtail. It is quite common in Europe, where it is native, and is generally regarded as a troublesome weed. It has only been sparingly introduced into this country. The seed, however, is advertised by New York dealers, the price being $25 per 100 pounds.

Alopecurus aristulatus. (See *Alopecurus geniculatus.*)

Alopecurus geniculatus Linn. Water Foxtail; Floating Foxtail. (Fig. 3.)

A low, usually procumbent grass, with slender stems 8 to 18 inches long, often rooting at the lower joints. It usually grows in wet places, and is very widely distributed throughout the north temperate zone. It has cylindrical heads or panicles, resembling those of Meadow Foxtail, but much smaller. This grass enters into the natural herbage of low, wet meadows and pastures, and in such places affords excellent grazing, being tender and nutritious. *Alopecurus aristulatus* is simply a variety of this, with short-awned flowering glumes. Under favorable circumstances this grass makes a good turf and a pleasing lawn of a deep rich green color, remaining green throughout the severe winter weather of the Middle States.

Alopecurus occidentalis Scribn. Mountain Foxtail; Mountain Timothy.

A grass of the mountain meadows of the Rocky Mountains, growing in rich soil along streams and in the open parks. It has slender, erect stems 2 to 3 feet high, with short, oblong heads, thicker and shorter than those of common Meadow Foxtail. This grass is occasionally found covering extensive areas to the exclusion of other species. It yields a large bulk of fine, long, bright-colored hay, which is highly valued where it can be obtained. For the more elevated meadows of the Rocky Mountain region, and doubtless also for the New England and north Middle States, this grass would form an excellent addition to the cultivated species, and its introduction is recommended.

Alopecurus pratensis Linn. Meadow Foxtail. (Fig. 4.)

This well-known European grass has been introduced into this country and cultivated to some extent in the New England and Middle States. It is a valuable grass for moist meadows and pastures, particularly the latter, on account of its early growth. On good soil it yields a large amount of excellent forage. In Europe it is regarded as one of the best perennial pasture grasses. It should enter into all mixtures for permanent pastures, because it is very lasting, highly nutritious, and earlier than most other species. This grass has a record of producing 20,418 pounds per acre of green grass, 6,125 pounds of hay, and 8,167 pounds of aftermath. It is never sown by itself, but is always mixed with other grasses and forage plants, because it gives a full yield only in the second or third year. Price of seed quoted in New York catalogues, $2.25 per bushel, or $25 per 100 pounds.

FIG. 4.—Meadow Foxtail. (*Alopecurus pratensis.*)

Ammophila arenaria Link. Beach-grass; Mat-grass; Common Sea-Reed; Sand-Reed; Reed; Sea-sand Reed; Marram. (Fig. 5.)

This grass grows more or less abundantly along the sandy coasts of the Atlantic, and the shores of the Great Lakes. It has strong, creeping rootstocks, upright

stems 2 to 4 feet high, and long, rather rigid, leaves. The narrow, densely flowered panicle which terminates the stems is from 3 to 10 inches long. It is one of the most valuable of the grasses adapted to binding the drifting sands of our coasts, and has been cultivated for this purpose in this as well as in other countries. The action of this grass in holding the drifting sands is like that of brush or bushes cut and laid upon the ground in accumulating snow when drifted by the wind. The sand collects around the clumps of grass, and as it accumulates, the grass grows up and overtops it, and will so continue to grow, no matter how high the sand hill may rise. This process goes on over the whole surface of the plantation, and thus many acres may be raised far above their original level. A plant will, by gradual up-growth, finally form stems and roots sanded in to the depth of fully 100 feet. Many years ago it was as customary to warn the inhabitants of Truro and some other towns on Cape Cod to turn out to plant Marram grass as it was in the inland towns to turn out and mend the roads. This was required by law, with suitable penalties for its neglect, and took place in April. Marram grass is best propagated by transplanting, the grass being pulled by hand and set in a hole about a foot deep and the sand pressed about it. These holes are dug about 1½ feet apart in rows 6 feet apart. It may also be propagated by seed. A wooden palisade should be erected near highwater mark to cause the formation of an artificial dune. Under such shelter the Marram seeds are sown and covered with brushwood to prevent the seed thus sown from moving. The planting may be done either in the spring or fall, and if seeds are used it should be done on the lowest parts of the beach or sand dunes, and these will rise while the highest places over which the grass will spread are being leveled by the wind. Beach-grass has been used for the manufacture of coarse paper, and it makes an excellent and very durable thatch. It is of no value for fodder.

FIG. 5.—Marram or Beach-grass. (*Ammophila arundinacea.*)

Ammophila arundinacea. (See *Ammophila arenaria.*)

Ammophila brevipilis. (See *Calamovilfa brevipilis.*)

Ammophila longifolia. (See *Calamovilfa longifolia.*)

Andropogon affinis R. Br. Blue-grass (in Australia).

A leafy perennial, 1 to 2 feet high, native of Australia, where it is regarded as a valuable pasture grass. It is related to the big blue-stem (*Andropogon provincialis*) of this country, but is smaller in every way.

Andropogon argenteus. (See *Andropogon saccharoides.*)

Andropogon argyræus Schult. Silver Beard-grass.

A native grass of rather slender growth, 2 to 3 feet high, with narrow leaves and silvery-white, hairy racemes which terminate the culm and its branches. It is found chiefly along the borders of woods and thickets and in open fields, and blooms in September. It is a more tender grass than the common Broom-sedge of the South, to which it is closely related, and may have some agricultural value, although no attempts have thus far been made to cultivate it.

Andropogon bombycinus R. Br. Silky Heads.

An erect, rigid perennial, 1½ to 3 feet high, with narrow, flat and rather rigid leaves and densely silvery-silky spikes in a panicle 3 to 6 inches long. Native of Australia, where it is highly esteemed as a fodder plant. It is a species particularly resistant to drought.

Andropogon citratus. (See *Andropogon schœnanthus.*)

Andropogon contortus Linn. Twisted Beard-grass.

A stout, leafy perennial, 1 to 3 feet high, affording excellent grazing when young, but the mature seeds are much dreaded by sheep owners, as by their peculiar structure they not only become attached to and injure the wool, but often penetrate the skin and even the intestines. The strong rhizomes and tough fibrous roots which this grass has, commend it as a soil binder for river banks, dams, etc. The awns indicate by their twisting the amount of moisture in the air, and may be used as rain or fair weather indicators. In India this grass is used for thatching. It is a native of tropical and subtropical regions of both hemispheres, extending northward into western Texas, New Mexico, and Arizona.

Andropogon erianthoides F. v. M. Satin-heads.

An Australian grass, 2 to 3 feet high, with narrow leaves and densely silky-bearded spikes. It is very productive and is regarded as one of the best fodder grasses of eastern and subtropical Australia, either for pasturage or hay.

Andropogon furcatus. (See *Andropogon provincialis.*)

Andropogon halepensis Sibth. Haleppo or Aleppo grass; Johnson-grass; Cuba-grass; St. Mary's-grass; False Guinea-grass; Means-grass; Guinea-grass, (see *Panicum jumentorum*); Egyptian Millet; Egyptian-grass; Green Valley-grass; Alabama Guinea-grass; Australian Millet; Morocco Millet; Evergreen Millet; Arabian Millet; Syrian-grass. (Fig. 6.)

FIG. 6.—Johnson-grass. (*Andropogon halepensis.*)

A stout perennial, with smooth, erect culms, 3 to 6 feet high, and strong, creeping rootstocks. The panicles are expanded during flower and are from 6 to 12 inches long. It is a native of southern Europe and the warmer parts of Asia and northern Africa. It was introduced into this country about sixty years ago, and has now become widely distributed and well known throughout the Southern States. In the warmer parts of the Southern States it makes rapid growth, is but little affected by drought, and the hay, if cut just as the grass is coming into bloom, is much liked by all kinds of stock. Two or three cuttings may be made during the season. The extensively creeping rootstocks are fleshy and tender, and hogs are very fond of them. These roots literally fill the ground near the surface, and every joint is capable of developing a new stem. This grass, when once it has become established, is exceedingly difficult to eradicate, and hence it has

come to be greatly feared by the majority of farmers. Unless one wishes to give up his land entirely to Johnson-grass, and can certainly avoid its spreading to the lands of others, its introduction would be of doubtful economy, owing to its powerful and rapidly spreading roots. In India the natives make rude pens from the stems.

Andropogon hallii Hack. Turkey-foot; Colorado Sand-grass.

This is a stout grass, from 3 to 6 feet high, closely related to the Big Blue-stem (*Andropogon provincialis*), but appears to be confined to the sandy regions of the West. It is common in the sand hills of Nebraska, and extends southward into Texas. Its agricultural value is not known, but it is probably about the same as that of Big Blue-stem.

Andropogon iwarancusa Blan.

A stout grass, 3 to 5 feet tall, native of southern Asia and tropical Africa, closely related to *A. nardus*. The root has a bitter and aromatic taste, and affords a medicine which in India is used for cholera.

Andropogon laniger Desf.

A slender, rigid grass, 1 to 2 feet high, native of India and northern Africa, growing in the dry, hilly, or mountain regions. It is sweet scented, and from it is manufactured a perfume (*Herba schœnanthi* or *Junci odorati*). The aromatic oil is sometimes used as a cooling medicine, and the fragrant roots are occasionally woven in screens and mats, as are those of *A. squarrosus*.

Andropogon macrourus Michx. Brook-grass; Cluster-flowered Beard-grass.

This is a stout-growing species, often attaining a height of 6 feet, and in many characters resembles the common Broom-sedge (*Andropogon virginicus*). It is far less common, however, and is confined to wet, swampy places, hence one of the common names "Brook-grass." It has no recognized agricultural value.

Andropogon montanus Roxb.

A native of southern Asia and northern and eastern Australia, with somewhat woody stems 12 to 20 inches high, narrow leaves and oblong panicle, 2 to 5 inches long. A perennial of rapid growth and valuable for fodder when young. The grain is collected and used as food by the natives of the hilly parts of northern India.

FIG. 7.—Bushy Blue-stem. (*Andropogon nutans.*)

Andropogon muricatus. (See *Andropogon squarrosus.*)

Andropogon nardus Linn. Citronella-grass.

A native of southern Asia and northern Australia; also cultivated in Ceylon because of its value in yielding, as it does, the oil of commerce known as citronella oil, which is used for scenting soap, as a condiment, and for perfumery. It is stated that 40,000 pounds of citronella oil are distilled from this grass annually in Ceylon, and the annual value of the export of this product from that country alone is placed at about $35,000.

Andropogon nutans Linn. Bushy Blue-stem; Indian-grass; Reed-grass; Wild Oat-grass. (Fig. 7.)

This is a stout perennial, 4 to 6 feet high, growing in dry soil along the borders of fields and open woods, and on the prairies in the West it often forms a

considerable proportion of the so-called prairie hay. It is held in little esteem in the Eastern and Southern States, but in the West it is said to make excellent hay, and is particularly valuable because of the relatively large amount of long root leaves which it produces. All stock eat it greedily. In South Dakota it is given the first place among the native grasses as a hay-producing species, thriving best on the rich prairie bottoms. During the dry season it produces but little seed, though it usually makes a good growth of root leaves. In the middle Atlantic States this grass seeds freely and the seeds are easily collected.

Andropogon pertusus Willd.

A slender, erect perennial, 1 to 3 feet high, native of southern Asia and tropical and subtropical Australia. In the latter country it is regarded as an excellent pasture grass, much liked by cattle and sheep, and possesses the special merit of withstanding long periods of drought.

Andropogon provincialis Lam. Big Blue-stem; Finger-spiked Beard-grass; Finger-spiked Wood-grass; Finger-spiked Indian-grass; Blue-stem; Blue-joint; Blue Bent (in Rhode Island); Blue-grass; Turkey-foot. (Fig. 8.)

A stout perennial, with erect, more or less branching, and often bluish or glaucous stems, 2 to 6 feet high, long leaves, and flowers in short spikes, which stand two to five close together at the apex of the stem or its branches. These spikes are bluish or purple, sometimes pale green, and more or less hairy. This grass has a wide range, extending over the United States east of the Rocky Mountains, and in the West and Northwest, particularly in the Missouri region, it is very abundant, and is highly valued for hay. It grows in a great variety of soils, and under extremely varying conditions of climate, and enters largely into the composition of the hay of the prairies. The early growth consists of a great abundance of long leaves, and if cut in early bloom the hay is readily eaten by horses and cattle, but if allowed to fully mature the stems become hard and woody and the hay produced is of inferior quality. Investigations of the seed production of this *Andropogon* indicate that it matures seed rarely. It is stated that a very favorable season of moisture is required to make it fruit abundantly. This lack of fertility, if really true, will be a serious obstacle to the general propagation of the grass by the usual and convenient method of seeding.

FIG. 8.—Big Blue-stem. (*Andropogon provincialis.*)

Andropogon saccharoides Swz. Silver Beard-grass.

A variable grass, growing, to the height of 1 to 3 feet, with narrow, silvery bearded panicles. Some forms of this species have been introduced into cultivation for ornament. It is a native of our Southwestern States and Territories, in some of its varieties extending southward to Chile, where it is regarded as one of the best pasture grasses of the Cordilleras.

Andropogon schœnanthus Linn. Lemon-grass; Ginger-grass; Rusa-grass; Geranium grass.

A native of southern Asia, Japan, and tropical Africa. This grass is closely related to *A. nardus*, and, like that species, yields a valuable product known in commerce as lemon-grass oil. This oil, as well as that obtained from *A. nardus*, is

used as a stimulant and antispasmodic for neuralgia and rheumatism, and also in the adulteration of attar of roses. *A. citratus* (referred to by Hackel as belonging to either *A. schœnanthus* or *A. nardus*) is extensively cultivated in India and Ceylon and yields a fragrant oil called both oil of verbena and lemon-grass oil (William Hutchinson). Rusa oil, or ginger oil, is obtained from *A. schœnanthus*, according to Hutchinson.

Andropogon scoparius Michx. Little Blue-stem; Indian-grass; Purple Wood-grass; Wire-grass; Brown-grass; White Bent; Broom Sedge; Broom-grass; Mountain Sedge-grass. (Fig. 9.)

A rather slender perennial, 1 to 3 feet high, more or less branched above; the slender racemes are single and terminate the culm or its branches. This grass has a similar range to the Big Blue-stem, extending over nearly all of the United States east of the Rocky Mountains, and in the prairie regions it is nearly always found associated more or less abundantly with the Big Blue-stem and Bushy Blue-stem. It is common in the mountain districts of the South, and is valued there for grazing. In the West it is cut for hay, but is not so much thought of as the Big Blue-stem. In South Dakota this is one of the most common grasses in the basins of the Bad Lands.

FIG. 9.—Little Blue-stem. (*Andropogon scoparius.*)

Andropogon sericeus R. Br. Blue-grass.

A rather slender branching grass, 1 to 3 feet high, native of the warmer regions of Australia. It is very productive, and is generally known as blue-grass. Regarded by the Australians as one of the best of the indigenous grasses for pasturage or hay making.

Andropogon sorghum Brot. Subspecies **sativus** Hack. Includes the cultivated varieties of sorghum.

Andropogon sorghum includes many varieties, a number of which have been recognized by some authors as distinct botanical species under the genus *Sorghum;* others, including Hackel, have referred them all to the genus *Andropogon.* Hackel has elaborately worked out the botanical characters of the species and characterized the known varieties, giving to each a technical name. It is not necessary to follow out his classification, which is apparently good. In the works of others there is much confusion in the botanical classification, and still more in the application of the common or English names. The same name has been applied to different varieties, and the same variety has often been designated under various names. All the forms are of Eastern origin, and have arisen probably from a common stock through ages of cultivation. From varieties of this species are obtained grain, which furnishes nutritious food for man and domestic animals, particularly poultry; sirup and sugar in commercial quantities are obtained from the saccharine varieties. The variety *saccharatus*, or Chinese sugar-grass, yields about 13 per cent of sugar. Brooms and brushes, used in all civilized countries, are made from the inflorescence of the variety known as broom corn, and all furnish fodder of more or less value for farm stock. In Africa alcoholic drinks are prepared from the grains, and useful coloring pigments are contained in the fruiting glumes. The variety known as Kafir corn, which grows to the height of 4 or 6 feet, has been cultivated with great success as a fodder plant in the semiarid regions of the West. In fact, all the sorghums will grow in drier climates or under more trying conditions of drought than Indian corn. They may be cultivated in much the same way as that cereal, but

the seed may be planted more thickly. In chicken corn or white Egyptian corn (var. *cernuum*) the densely flowered panicle is abruptly bent or recurved, so that it points downward. This variety is largely cultivated in tropical and northern Africa and in some parts of southern Asia, where it is used as a cereal. It is occasionally grown in this country, the seed being prized as food for poultry. The varieties adapted for the production of fodder or silage are particularly valuable for cultivation in the South and Southwest. The amount of fodder produced is often very large, of excellent quality, and there are few among the larger grasses better adapted for soiling. Yellow Milo Maize, White Milo Maize, and Jerusalem Corn, non-saccharine varieties of *Andropogon sorghum*, are grown both for fodder and for the seed, particularly in the Southwestern States.

Andropogon sorghum var. **halepensis.** (See *Andropogon halepensis.*)

Andropogon sorghum var. **vulgaris.** Name now adopted for *Sorghum vulgare.* (See *Andropogon sorghum.*)

Andropogon squarrosus. Linn. f. Vetivert; Khushus or Bene.

A stout perennial, 4 to 6 feet high, with strong, fibrous, and highly fragrant roots. A native of India, occurring also in some of the West India Islands and Brazil, growing in marshes and on river banks. Introduced into Louisiana many years ago, and now spontaneous in some of the lower parts of that State. Cultivated successfully at Knoxville, Tenn., where the fragrance of the rhizomes and roots was developed to a marked degree, but the plants did not bloom. In India this grass is largely used for thatching, and is woven into mats, which serve as screens or shades for doors and windows (tatties), awnings, covers for palanquins and fans, and brushes used by weavers in arranging the thread of the web are made from either the roots or the whole plant. The roots, laid among clothing, impart a pleasing fragrance to the garments and are said to keep them free from insects. Fans made from the root fibers were among the articles on sale at the World's Fair in the Javanese bazaar. The roots are an article of commerce sold by druggists. In European drug stores the roots are known as *Radix anatheri* or *Radix vetiveriæ*, a stimulant or antiseptic. They yield a perfume known as *vetivert*, or, in India, *itar*.

FIG. 10.—Broom Sedge (*Andropogon virginicus.*)

Andropogon virginicus Linn. Broom-sedge; Broom-grass; Virginia Beard-grass; Sedge-grass. (Fig. 10.)

A rigidly erect perennial, 2 to 4 feet high, bearing a narrow, elongated, and loosely-branched panicle of silky-bearded racemes. The stems are strongly flattened near the base, and at maturity they are too hard and woody to be eaten by stock or to be of any value for hay. When young, however, this grass affords most excellent grazing. Milch cows fed upon it are said to yield butter of superior quality. There is probably no native grass better known to the farmers of the South than this, and although possessing some value, as here indicated, it is, broadly speaking, one of the worst weeds of that section, interfering seriously with the formation of permanent meadows. Constant tillage or very close grazing appear to be the only means of keeping this grass from occupying the land.

Anthistiria avenacea F. v. Muell. Tall Oat-grass.

This is said to be one of the best fodder grasses of Australia, where it is native, and widely distributed over that continent. It grows mostly in tussocks, 4 to 5 feet high, producing a large quantity of leaves at the base, which, when young, yield a large amount of nutritious fodder. It is only found upon the richest soils and is particularly noticeable for its drought-resisting qualities, due doubtless to its deeply penetrating roots. The seeds are large, resembling oats somewhat in appearance, and they can be easily harvested. Mr. Fred Turner recommends this grass for systematic cultivation, both in the coastal regions and in the interior. It is deserving of trial in our Southern States. Hackel classes this species under *Themeda gigantea* as a variety.

Anthistiria ciliata Linn. Kangaroo-grass.

A perennial, 1 to 3 feet high, native of tropical Asia and Africa, extending into Australia, where it is commonly known as "Kangaroo-grass," and regarded as one of the most valuable of the indigenous species for grazing. It is a grass quite similar in habit to the Broom-sedge of our Southern States, and is probably of less value than the Blue-joint of our prairie regions (*Andropogon provincialis*).

Anthoxanthum odoratum Linn. Sweet Vernal-grass; Sweet-scented Vernal-grass; Sweet-scented Spring-grass; Sweet-scented-grass; Vernal-grass. (Fig. 11.)

A perennial, early-flowering, sweet-scented grass, introduced into this country from Europe, and now widely distributed over the Eastern and Central States. It is an inferior fodder grass, but owing to its earliness it possesses some value in mixtures for pastures, and its sweet scent adds a pleasing fragrance to hay, of which it should form only a small percentage. The leaves have a bitter taste, and the grass is apparently unpalatable to stock, for they will not readily eat it. It is regarded as a serious pest in New Zealand. The stems have been used in the manufacture of imitation Leghorn hats. Price of seed quoted in New York catalogues, $6 per bushel. Weight per bushel, about 10 pounds.

FIG. 11.—Sweet Vernal-grass. (*Anthoxanthum odoratum.*)

Aristida californica Thurb. Hare's-grass, "Zacate de liebre."

A low, much branched, tufted grass, 5 to 10 inches high, native of the arid regions of southern California and Mexico. It has no agricultural value.

Aristida dichotoma Michx. Poverty-grass.

A much-branched, slender annual, 6 to 18 inches high, common in dry, sterile soils in open fields, whence the name "Poverty-grass," frequently applied to it. Wholly worthless.

Aristida lanata Poir. Woolly Poverty-grass; Woolly Triple-awn; Poverty-grass.

A rather stout perennial, with simple stems 2 to 3 feet high. More or less common in the pine barrens of the south Atlantic States. Has no agricultural value.

Aristida oligantha Michx. Prairie Triple-awn.

A tufted, much-branched, native annual grass, 6 to 18 inches high, common from Maryland to Illinois and southward, growing in dry, gravelly soil in open fields. Blooms in the latter part of the summer, and when abundant the long-bearded flowers impart to the field a grayish hue. Of no agricultural value, but rather a weed, indicating poor soil or a shiftless landowner.

Aristida purpurascens Poir. Beard-grass.

A taller and somewhat stouter grass than *Aristida oligantha*, and less branched. It grows in similar situations, ranging from Massachusetts to Michigan and southward to Florida. Valueless.

Aristida purpurea Nutt. Purple Beard-grass; Western Beard-grass; Beard-grass; Mesquit (or Mezquit) grass. (Fig. 12.)

Purple Beard-grass grows from 6 inches to a foot high, and is a native of the arid regions, from Montana southward to Texas, where it is particularly abundant in poor soils, and presents a great variety of forms. It is usually found in dry, gravelly soils on the plains, mesas, and foothills. In the Eastern and Middle States the species of *Aristida* are deemed of little or no value, but in the South-

FIG. 12.—Purple Beard-grass.
(*Aristida purpurea.*)

FIG. 13.—Tall Oat-grass.
(*Arrhenatherum elatius.*)

west, where every mouthful of fodder of any sort has value, they are not wholly worthless. *Aristida schiedeana* and *A. bromoides*, growing upon rocky and desert soil in Arizona and New Mexico, supply in their thin, scattered tufts "dainty bits seized upon by stock with avidity." (Pringle.)

Aristida setacea Retz.

Common in the drier regions of India, growing in dry, poor soils. The Telinga paper-makers construct their frames of the culms. This grass is used also for making brooms, toothpicks, and screens called tatties.

Aristida stricta Michx. Downy Triple-awn; Wire-grass.

This is one of the "wire grasses" of the Southern States, growing to the height of 2 or 3 feet. The simple stems are terminated by a narrow panicle, usually a foot in length. It is common along dry, sandy ridges and in the pine barrens.

Aristida tuberculosa Nutt. Long-awned Poverty-grass.

A rigid, much-branched grass, 12 to 18 inches high, with long-bearded spikelets. Found in similar situations with *Aristida stricta*, and equally valueless.

Aristida virgata Michx. Beard-grass.

Similar in habit and appearance to *Aristida stricta* and of about the same agricultural value.

Arrhenatherum avenaceum. (See *Arrhenatherum elatius.*)

Arrhenatherum elatius M. & K. Tall Oat-grass; False Oat-grass; Tall Meadow Oat-grass; Evergreen-grass; Oat-grass; Grass-of-the-Andes; French Rye-grass. (Fig. 13.)

A loosely tufted perennial, 2 to 4 feet high, introduced from Europe as a fodder grass and now quite generally distributed over the regions east of the Mississippi. In Europe it is regarded as one of the best meadow grasses, but is not recommended for pastures. It does well in the Southern States, where it is frequently cultivated, and is valued both for winter grazing and for hay. In California it is spoken of in the highest terms, particularly for its drought-resisting qualities. It does not form a very compact turf, and when sown should be mixed with other grasses. It grows rapidly, blooms early, and when cut dries out readily. It is not suited to heavy, moist soils, but thrives best on loamy sands or loams. It produces a large yield, and on good soils three or four cuttings may be obtained during the season. It is best sown in the spring, but in the Southern States it may be sown in September to advantage. In New Zealand this grass is spoken of as fast becoming a weed in mixed pastures, and further, it is stated that the early growth is much relished by stock, but later in the season it is not touched. On rich, clayey loam this grass has made a yield of 17,015 pounds of green fodder, 6,380 pounds of hay, and 13,612 pounds of green aftermath per acre. When sown alone, the amount of seed to sow per acre is 5 to 6 bushels. Owing to the structure of the seed, it may be sown deeper than most other grasses. Price of seed, quoted from New York catalogues, $3.25 per bushel, or $18 per 100 pounds.

FIG. 14.—Cane. (*Arundinaria gigantea.*)

Arundinaria gigantea Chapm. Cane; Large cane. (Fig. 14.)

This is the grass which forms the well-known canebrakes of the South. It is perennial, with woody stems 10 to 30 feet high, and evergreen leaves, which furnish a valuable supplement to the winter pastures. Thousands of animals have almost no other food. The fodder furnished, however, does little more than sustain life, and is of no value for fattening or for milch cows. Attempts made to cultivate this grass have not been successful. The plant blooms but once, and when the seeds mature the cane dies. The canes are used for many purposes, such as fishing rods, scaffolds for drying cotton, splints for baskets, mats, etc.

Arundinaria macrosperma. (See *Arundinaria gigantea.*)

Arundinaria tecta Muhl. Small cane; Reed.

This is regarded by some as only a variety of the cane mentioned above, but it is of smaller growth, rarely exceeding 10 feet in height, and extends as far north as Maryland. Its woody stems and perennial leafage are like those of *A. gigantea*, affording similar fodder to cattle upon the winter ranges.

There are many species of *Arundinaria* in India. Among them may be mentioned:

Arundinaria falcata. An annual, 6 to 10 feet high. The stem and leaves are used for roofing and in making baskets.

Arundinaria hookeriana furnishes rice-like edible seeds, which are boiled and made into cakes or into beer.

Arundinaria racemosa, with stems 2 to 4 feet high. Used for making mats and roofing. A good fodder plant.

Arundinaria wightiana. Furnishes the walking sticks of Mahableshware. The young stems are eaten.

Arundo donax Linn. Reed; Cane.

A tall, leafy perennial, attaining the height of 10 to 15 feet, or in very favorable locations, even 30 feet. The leaves are broad and widely spreading, and the stems are leafy to near the top. The panicle has some resemblance to that of pampas grass, but is not so large. This grass is grown for lawn decoration and to conceal unsightly objects. It is a native of southern Europe, northern Africa, and western Asia, and is said to be spontaneous along the Rio Grande. In some countries the stout stems are used for laths, and when split, for woven work; the leaves are used for thatch or roofing, and the stout rhizomes are employed as a diuretic. A cultivated variety has its broad leaves striped with longitudinal white bands. It presents a very striking appearance. This grass is propagated by transplanting the roots, which work may be done at any time during the season. After growth has fairly commenced the subsequent development is very rapid, and for this reason it is one of the most important plants of its class for quickly producing scenic effects or for concealing unsightly objects.

Asprella hystrix Willd. Bottle Brush; Hedgehog-grass.

A rather stout, perennial grass, 3 to 4 feet high, with spreading flat leaves 5 to 10 inches long, and terminal bearded spikes 3 to 6 inches long. It is a native, growing in moist woodlands and along thicket borders. When mature the spikelets stand out at right angles to the axis and give the head the appearance of a brush such as is used for cleaning bottles, hence the common name. This grass has been recommended as ornamental, for lawn decoration. It possesses no recognized agricultural value.

Astrebla pectinata F. v. Muell. Mitchell-grass.

A smooth, erect grass, 1½ to 3 feet high, with flat, long-pointed leaves and densely flowered terminal spikes or heads. It is a native of Australia, growing naturally upon the interior plains. It is regarded by the stockmen of that country as the best of all native grasses, both for its drought-enduring qualities and for its fattening properties. If cut just when coming into bloom, it makes excellent hay. The seed is produced in abundance, and is easily collected. This may prove a valuable grass for the semiarid districts of the Southwest. The seeds of this grass, as well as those of the closely related *Astrebla triticoides*, were formerly used for food by the natives of Australia.

Avena elatior. (See *Arrhenatherum elatius.*)

Avena fatua Linn. Sand-oats; Wild-oats. (Fig. 15.)

An erect annual, 2 to 3 feet high, with loose, open panicles, 8 to 10 inches long, the whole aspect of the plant closely resembling forms of the cultivated oat. The

spikelets are larger, however, and the flowering glumes are covered with long, brown hairs, and have a twisted awn an inch in length. It is a native of the Mediterranean region, but is now widely distributed over grain-growing countries, and is especially common in California and Oregon, and has spread eastward to Minnesota. It is of rare occurrence in the Eastern States. By some this is supposed to be the original of the cultivated oat (*Avena sativa*), which is said to readily degenerate into it. *Avena fatua* is in most places regarded as a troublesome weed. When abundant in the grain fields, it occupies the place of better plants, and reduces the grade of the thrashed grain by the admixture of its inferior and lighter seeds. The stiff and twisted awns are injurious to stock, as they frequently cause irritation of the nostrils and mouths of the cattle feeding upon them.

FIG. 15.—Wild Oats. (*Avena fatua*).

In California the young plants, before the bearded or awned spikelets mature, are esteemed for grazing and forage. "The use of the Wild-oat, with its brown, hairy seed and twisted awn, as an artificial fly by fishermen, is well known, the uncoiling of the awn when wetted causing those contortions by which it imitates a fly in trouble." (Hooker.) A form of the Wild-Oat with the flowering glume smooth (var. *glabrescens* Coss.) is quite widely distributed on the Pacific Slope.

Avena flavescens. (See *Trisetum pratense.*)

Avena hookeri Scribn. Native Meadow Oat-grass.

In the grassy parks and on the foothills of the eastern slopes of the Rocky Mountains, this *Avena*, which closely resembles the *Avena pratensis* of Europe, is frequently found associated with the other native grasses. Where abundant it makes a valuable addition to the grazing resources of the country. It is deserving of a trial under cultivation.

Avena præcox. (See *Aira præcox.*)

Avena pubescens Linn. Downy Oat-grass.

This grass is similar in habit and appearance to *Avena fatua*, but is much less common. It is a European grass, and has been introduced into this country from that source, and is occasionally found in the grain region of the Pacific Slope. The soils best suited to the growth of this grass are sandy loams, upon which it is valuable for early mowing and pasturage. Under favorable conditions it has produced 15,654 pounds of green grass, 5,870 pounds of hay, and 6,860 pounds of aftermath per acre.

Avena sativa Linn. Oats.

A well-known erect annual, 2 to 4 feet high, with flat leaves and expanded panicles of rather large pendulous spikelets. There are many varieties, which have been divided into two classes: "panicle oats," with widely spreading panicle branches; and "banner oats" with the panicles somewhat contracted and one-sided. These two races are divided into "chaffy" and "naked-fruited" sorts, and further

varieties are established upon the color, form, or some special character of the grain. Oats have been cultivated from very early times in Europe, and they form the principal grain of such northern countries as Norway and Sweden, and Scotland, and in these countries boiled oatmeal and oatmeal cakes are important articles of food. Boiled oatmeal is also much used in this country, especially at breakfast. The grain, however, is principally cultivated here as food for horses. In the Southern States, oats, particularly winter oats, are largely grown for forage. Sown in August, they furnish the best grazing from October to the latter part of April, and will then yield a more certain and a larger crop of grain than spring-sown oats. They are often cut green for soiling and for hay. Oat hay is quite extensively used in the South and in California. The practice is to cut when the grain is in the "dough" stage, or when the straw commences to turn yellow below the head and the leaves are still green. The yield ranges from 3 to 4½ tons per acre, according to the variety and the season. The feeding value of oat hay is higher than that of timothy, containing from 10 to 12 per cent of protein, and 55 to 65 per cent of fat formers, while the latter (timothy) contains from 5 to 7 per cent protein, and 45 to 55 per cent fat formers. Among the cereals, oats is the most nutritious, but oaten flour lacks the gluten of wheat, rendering the making of bread from it impossible. Oatmeal is richer in nitrogenous matter than soft wheats, and contains more fat than any of the other grains. Russian "quas" beer is made of oats.

Avena sterilis L. Animated Oats.

A stout, oat-like grass, with one-sided panicles, and very large, awned spikelets; the awn is very long, twisted, and "kneed" or geniculate. It is the twisting and untwisting of these awns when exposed to changes of moisture and dryness that has given to this grass the common name of "animated oats." The untwisting or coiling-up of the awn causes the spikelet to tumble about in various directions, suggestive of independent motion or life-like activity.

Avena striata Michx. Purple Wild Oat-grass.

This is a slender woodland grass of graceful habit, found in the northern Middle States, and extending westward to the Rocky Mountain region. Of no agricultural value, but possibly worthy of some attention for cultivation in woodland parks or pastures in the Northern States.

Bambusa. Bamboo.

The bamboos belong to the *Bambuseæ*, a tribe of grasses numbering about 175 species, chiefly limited to South America, southern and eastern Asia, and the East Indies. There are no European species, and only one in North America. Of the whole number of species only one is common to both hemispheres. The largest bamboos attain a height of 120 feet, with a diameter of a foot or more. A South American species has leaves 3 to 12 inches wide and 5 to 15 feet long. In India are extensive bamboo forests, and in countries where these grasses abound they are employed for many purposes. They furnish material for the complete construction and furnishing (including domestic utensils) of houses. They are used in shipbuilding and in the construction of bridges. Buckets, pitchers, flasks, and cups are made from sections of the stems. Baskets, boxes, fans, hats, and jackets are made from split bamboo. Ropes and Chinese paper are made from these grasses. A Chinese umbrella consists of bamboo paper, with a bamboo handle, and split bamboo for a frame. The leaves are used for packing, filling beds, etc., and occasionally serve as fodder for stock. The young shoots serve as a vegetable. Tabashir, or bamboo manna, a silicious and crystalline substance which occurs in the hollow stems of some bamboos, is regarded as possessing medicinal properties. Good drinking water collects in quantities in the

hollows of the internodes of many of the larger bamboos. All sorts of agricultural implements, appliances for spinning cotton and wool or for reeling silk are often constructed entirely from bamboos. Very many articles of household use or decoration made from bamboo have become articles of commerce in Europe and this country. So many and varied are the uses of the several species of bamboo that it is possible to mention here only a small part of them. Bamboos are propagated by seed, but more often by cuttings. Plants from the seed do not attain a sufficient growth to admit cropping under 10 or 12 years.

Beckmannia erucæformis Host. Slough-grass (in Montana); Wild Timothy (in Nevada). (Fig. 16.)

A stout, erect, subaquatic perennial, 1 to 4 feet high, with narrow, densely flowered panicles. The leaves are broad and flat, and the stems are coarse but tender, becoming somewhat woody when old. It grows along the banks of streams and rivers and frequently follows the course of the irrigating ditches. When young, however, this grass is palatable and readily eaten by stock. In some portions of the Northwest, to which region this grass is confined in this country, it often occurs in such quantities as to constitute an important part of the forage of low pasture lands. It may be recognized by the peculiar, spike-like branches of the panicle, which have some resemblance to the rattles of a rattlesnake, and for this reason it is sometimes called "Rattlesnake-grass." It is deserving of trial under cultivation for low meadow lands in the more Northern States.

FIG. 16.—Slough-grass. (*Beckmannia erucæformis.*)

Blepharidachne. Desert-grass.

There are two species of *Blepharidachne*, both low, tufted grasses, peculiar to the barren and desert regions of Nevada, Arizona, and New Mexico. They do not appear to be at all common, but in the regions where they occur every grass possesses some value for wandering stock, and these doubtless play some part in affording a bite for starving cattle.

Bouteloua curtipendula. (See *B. racemosa.*)

Bouteloua eriopoda Torr. Woolly-jointed Grama.

This is one of the species of Grama so valuable for grazing in New Mexico and Texas. The slender stems are 1 to 2 feet high, and from its thrifty habit of growth it forms dense and excellent pasturage wherever it grows abundantly. It is a common grass along the Del Norte and in the region between that station and the waters of the Gila; also in the Olympia, Guadalupe, and Eagle mountains, and on the Staked Plains in Texas. The woolly-jointed stems at once serve to distinguish this from the allied species of *Bouteloua.*

Bouteloua hirsuta Lag. Black Grama (Texas); Bristly Mesquit, Muskit, or Meskit-grass; Tall Grama. (Fig. 17.)

This grass is very similar in habit, appearance, and qualities to Blue Grama, and is frequently found associated with it, although, generally speaking, it is much less abundant.

Bouteloua oligostachya Torr. Blue Grama (Texas); Mesquit-grass; Muskit-grass; Grama; Black Grama (New Mexico); Mosquit-grass; Buffalo-grass (in Montana); White Grama; Crowfoot Grama. (Fig. 18.)

This is one of the most abundant and most valued of the Grama grasses, and extends from Wisconsin westward to California, and southward into Texas and northern Mexico. It is a perennial, 6 to 18 inches high, its strong rhizomes and numerous root-leaves forming dense and more or less extensive patches of excellent turf. In Montana it is known as Buffalo-grass. It frequents the bench lands of that State, growing at elevations from 3,000 to 4,000 or 5,000 feet, and not infrequently covers wide areas. No other grass better withstands the tramping of stock, and it is unsurpassed for grazing purposes. In the Southwest it forms a large proportion of the hay delivered at the various military posts and stage stations, and is considered the best obtainable there. Like the true Buffalo-grass, it cures during the dry season in the turf into perfect hay, losing none of its nutritious properties.

FIG 17.—Black Grama. (*Bouteloua hirsuta.*)

FIG. 18.—Blue Grama. (*Bouteloua oligostachya.*)

FIG. 19.—Tall Grama or Side Oats. (*Bouteloua racemosa.*)

Bouteloua polystachya Torr. Low Grama; Six-weeks'-grass; Many-eared Grama.

This is a small, slender grass, of good quality. It is one of the smallest of the Gramas, and only occurs sparingly here and there in scattered tufts. It rarely exceeds 6 inches in height, and is confined to the arid regions of the Southwest.

Bouteloua racemosa Lag. Tall Grama; Side Oats; Hairy Mesquit; Muskit-grass; Black Grama; White Grama. (Fig. 19.)

This is among the tallest of our species of *Bouteloua*, the rather stout, tufted stems being from 1 to 3 feet high. It has tough, perennial, fibrous roots, flat, long-pointed leaves, and many short spikes arranged along the upper portion of the stem. Its range extends from New Jersey westward to the Rocky Mountains, and southward through Texas into Mexico. Where abundant, it is said to make fair hay, and the numerous root-leaves afford good pasturage. The hay is

readily eaten by stock, but on the range cattle show a decided preference for Blue Grama. Several species of the Grama have been successfully grown in small cultures at some of the experiment stations, but none of them, although apparently most valuable as pasture grasses for the semiarid regions, have been introduced into general cultivation.

Bouteloua texana Watson. Texan Mesquit; Mesquit.

This is a small but excellent grass, common about San Antonio and at other points in Texas, chiefly along the Rio Grande. It has not been recognized as an important grass in the stock ranges.

Brachypodium japonicum Miq. Japanese Wheat-grass.

A promising Japanese perennial, closely resembling Bearded Wheat-grass (*Agropyron caninum*), but of rather stronger growth. It was introduced into California by the Agricultural Experiment Station of the University of California, at Berkeley, from New Zealand, in 1886, and the first seed was distributed in California in 1889. It has been cultivated with success at a number of points in California and at several of the experiment stations in the East. In the Southern States it is regarded as a valuable grass for winter grazing, as it makes its best growth during the cooler months.

FIG. 20.—Small Quaking-grass. (*Briza media.*)

Briza bipinnata Linn. (See *Eragrostis cynosuroides.*)

Briza media Linn. Quaking-grass. (Fig. 20.)

An erect perennial, from 1 to 2 feet high, introduced into this country from Europe because of its pleasing ornamental appearance. It has escaped from cultivation in many places, and has become sparingly naturalized. It is occasionally cultivated for ornament, and the nodding panicles of rather showy spikelets are used for winter bouquets. It is but little known here, but is classed as a valuable meadow grass in Middle Europe and is recommended as an admixture for pastures on dry, thin soils. *Briza minor* is a smaller and more delicate annual species, also cultivated occasionally as an ornamental and for dry bouquets. *Briza maxima*, also an annual, is a larger ornamental species.

Brizopyrum siculum. (See *Desmazeria sicula.*)

Bromus ciliatus Linn. Swamp Chess; Fringed Brome-grass.

A native perennial of wide range, frequent in open woodlands, growing to the height of 3 to 5 feet. It is leafy to the top, and would doubtless make a hay grass of good appearance, although of somewhat inferior quality. No attempts have been made to cultivate it for agricultural purposes. It makes a vigorous early growth on good soils and is recommended for propagation in wooded parks and woodland pastures.

Bromus erectus Huds.

A native of southern Europe, northern Africa, and western Asia. In habit this grass resembles Hungarian brome-grass (*B. inermis*), but the panicle is less spreading

and the spikelets are awned. It is a perennial, and is regarded as an important grass for dry limestone regions.

Bromus inermis. Hungarian Brome-grass; Couch-Brome; Awnless Brome-grass; Austrian Brome-grass; Smooth Brome. (Fig. 21.)

An erect perennial, 2 to 5 feet high, with strong creeping rootstocks, and a loose open panicle, 4 to 6 inches long. A native of Europe introduced into this country by the Agricultural Experiment Station of the University of California about 1880 and gives considerable promise of value both for hay and pasturage. It is strongly stoloniferous, and quickly makes a thick, firm turf. It appears to have grown with equal vigor in Canada and in Tennessee, remaining green throughout the winter season in the latter State. The strong perennial character of this Brome-grass and its unusual drought-resisting powers are qualities which recommend it for general cultivation, particularly in the semiarid regions of the West and Northwest. It thrives well on dry, loose soil, but of course the better the soil the greater the yield. Its nutritive value is comparatively low, and before undertaking its cultivation the fact that it is somewhat difficult to eradicate when once established, although by no means so difficult as Couch-grass or Johnson-grass, should be remembered. In Europe it is classed among the best forage plants. The seeds are quoted in New York catalogues at from $20 to $22 per 100 pounds. A bushel weighs about 14 pounds. Sow three bushels to the acre if sown alone. In this country the yield of seed per acre has been 600 pounds, which at the prices named would make it a very profitable crop.

FIG. 21.—Hungarian Brome-grass. (*Bromus inermis.*)

Bromus kalmii Gray. Wild Chess.

A perennial, native, 18 inches to 3 feet high, more or less frequent in dry, open grounds and borders of thickets, from Maine to Pennsylvania and westward to the Rocky Mountains. It is less common than *Bromus ciliatus*, and nothing is known of its agricultural value.

Bromus mango Desv.

A stout, tufted grass, about 2 feet high, in appearance closely resembling *B. secalinus*, native of the west coast of South America. Before the conquest and the subsequent introduction of European cereals, the seeds were the principal food grain of the natives of Chile and Peru.

Bromus mollis Linn. Soft Chess; Soft Brome-grass.

An erect annual, 1 to 3 feet high, having the sheaths, leaves, and spikelets of the erect panicle softly pubescent. It has a marked resemblance to Cheat, from which it differs in its more erect panicle and hairiness. It is a native of Europe, but has become widely disseminated in this country, although less common than Cheat and Smooth Brome-grass, but like these can only be regarded as a weed. It has, however, been recommended for cultivation on thin, sandy land where better grasses will not succeed. The retail price of seed as quoted in New York catalogues is $13 per 100 pounds.

Bromus pratensis. (See *Bromus erectus.*)

Bromus pumpellianus Scribn. Western Brome-grass.

A native of the Northwestern States in the Rocky Mountain region extending into Canada. In habit of growth it closely resembles Hungarian or Awnless Brome-grass (*B. inermis*) and is doubtless equally valuable. Prof. James Fletcher, who has cultivated this grass at the experiment station at Ottawa, Canada, says, "This is a very valuable grass, producing an abundance of leaves, continuing in flower for a long time, and giving a heavy aftermath."

Bromus racemosus Linn. Smooth Brome-grass; Upright Chess.

An introduced annual, 1 to 3 feet high, with more or less spreading and nodding panicles and smooth spikelets. This is a very common grass in cultivated fields and waste places, and is often mistaken for Chess, from which it differs chiefly in its narrower panicles and straight awns, which are nearly as long as the flowering glumes. This grass has become very common in certain sections, particularly in the South. A field of it presents an attractive appearance, and the hay produced is of good quality.

FIG. 22.—Chess. (*Bromus secalinus.*)

FIG. 23.—Rescue-grass. (*Bromus unioloides.*)

Bromus schraderi. (See *Bromus unioloides.*)

Bromus secalinus Linn. Chess; Cheat; Willard's Brome-grass. (Fig. 22.)

A well-known weedy, annual grass, introduced into this country many years ago, and now common in grain fields and waste lands. The panicle is spreading and more or less drooping, and the awns of the flowering glumes are usually much shorter than the glumes themselves and more or less flexuose. The idea that Cheat or Chess is degenerated wheat has no foundation whatever in fact. Only Cheat seeds will produce Cheat, and it is certain that wherever these plants

appear they were preceded by Cheat seeds, which may have been introduced with the grain sown, or brought by birds or animals from other fields. Cheat and wheat are only remotely related; they belong to quite distinct tribes in the grass family and wheat is less likely to change into cheat in a single generation than the more nearly allied oats, or than wheat is to change into barley, with which it is very closely related.

Bromus unioloides Willd. Rescue-grass; Schrader's Brome-grass; Australian Oats; Australian Prairie-grass; Arctic-grass. (Fig. 23.)

This *Bromus*, which is a native of South America, and probably also of the extreme southwestern portion of the United States, is a strong-growing grass, with rather broad, much flattened, usually bearded spikelets. It grows to the height of 1 to 3 feet, and in the more vigorous plants the branches of the nodding panicle are widely spreading. It grows rapidly, seeds freely, and dies after seeding. If, by frequent mowing or close grazing, it is prevented from going to seed, its duration may be continued over two or three years. If the seeds are allowed to fall, as they frequently do when mature, young plants soon appear, and a fairly continuous growth of this grass may thus be maintained. In many parts of the Southern States, where it has been most cultivated, it has come to be regarded as one of the best winter grasses, as it makes its chief growth during the cooler months of the year. Sow in August or September, at the rate of 30 to 40 pounds to the acre.

FIG. 24.—Buffalo-grass. (*Buchloë dactyloides.*)

Bromus willdenovii. (See *Bromus unioloides.*)

Buchloë dactyloides Engelmann. Buffalo-grass; False Mesquit; Early Mesquit, Meskit-grass. (Fig. 24.)

This is the true Buffalo-grass of the Great Plains region, which is reported to have been much more abundant and more widely distributed in times past than it is at present. Now, however, it is known to extend from the British Possessions southward into Texas, where it is considered an invaluable grass and one of the best constituents of sheep pastures. It has a low habit of growth, rarely more than 5 or 6 inches high, and produces numerous creeping and widely spreading branches or stolons, which root at the joints, each joint forming a new tuft, and in this way the grass often covers large areas with a close mat of fine-leafed herbage, which is greatly relished by all grazing animals. As a winter forage, it is without an equal. The habit of growth of this plant is very similar to that of Bermuda-grass, but the stems and leaves are much finer and the turf formed more compact. Live roots transplanted from Nebraska to the grounds of the Department of Agriculture at Washington, D. C., have grown with remarkable vigor, and it may be possible to utilize this most palatable and nutritious grass in portions of the Eastern or Southern States.

FIG. 25.—Blue-joint. (*Calamagrostis canadensis.*)

Bulbilis dactyloides. (See *Buchloë dactyloides.*)

Calamagrostis arenaria. (See *Ammophila arenaria.*)

Calamagrostis brevipilis. (See *Calamovilfa brevipilis.*)

Calamagrostis canadensis Beauv. Blue-joint-grass; Sand-grass; Red-top; Canadian Small-reed; Fowl Meadow-grass. (Fig. 25.)

A native grass common in the Northern and Northwestern States, extending clear across the continent, usually growing in moist meadows. The leaf stems are 3 to 5 feet high, and the open brown or purplish panicle has some resemblance to that of Red-top. Occasionally it is found occupying considerable areas to the exclusion of other grasses, and under such conditions it yields a large amount of excellent hay, highly prized by farmers and eaten with avidity by all farm stock. This grass grows naturally on low, moist meadows, and has succeeded well under cultivation. In the northern portion of the United States its more extended culture for hay is recommended.

Calamagrostis coarctata. (See *Calamagrostis nuttalliana.*)

Calamagrostis howellii Vasey. Howell's-grass.

This is a densely tufted, leafy grass, 1 to 2 feet high, native of Oregon and Washington. From its habit of growth it doubtless possesses some agricultural value, and is certainly worthy of experimental culture in the States where it is native.

FIG. 26.—Long-leafed Bent. (*Calamovilfa longifolia.*)

Calamagrostis longifolia. (See *Calamovilfa longifolia.*)

Calamagrostis neglecta Kunth. Pony-grass.

A rather slender, erect perennial, with narrow leaves, and a contracted, densely flowered, brownish panicle 3 to 6 inches long. A native of Northern Europe and North America, ranging along our northern borders from Newfoundland and Maine to the Pacific, being most abundant in the Rocky Mountain region. Under experimental cultivation it has succeeded well. It is a productive grass, much liked by stock, especially horses, and is deserving a place among the cultivated species.

Calamagrostis nuttalliana Steud. Reed Bent-grass; Wild oats.

A stout, reed-like grass, 3 to 5 feet high, not infrequent in low, moist grounds and swamps, ranging from New England southward to Tennessee. No attempts have been made to cultivate it, and little is known of its agricultural value. Probably of some use for low woodlands where grasses are desired for pasturage, and if it will thrive in the open it would make a most excellent hay-grass for low meadows.

Calamovilfa brevipilis Scribn. Purple Bent.

This is a rather rare grass, apparently limited to the sandy swamps and pine barrens of New Jersey, but probably extends southward along the coast to Florida. It has rather hard, wiry stems 2 to 4 feet high, flat leaves and open, purplish, nodding panicle. Of no recognized agricultural value.

Calamovilfa longifolia Scribn. Sand-grass; Woolly Bent-grass; Long-leafed Bent. (Fig. 26.)

A stout, long-leafed grass, 1 to 4 feet high, growing in sands or sandy soil along the shores of the Great Lakes and in the Missouri region of the West, extending southward to Kansas. Its very strong and far reaching rhizomes or creeping "roots" make this an exceedingly valuable grass for binding drifting sands, or those subject to wash by swift currents or the beating of the waves. As a sand

binder for interior regions of the country this grass is probably unsurpassed. Its long, tough leaves suggest a possible value for paper-making.

Capriola dactylon. (See *Cynodon dactylon.*)

Cenchrus echinatus Linn. Cock-spur.

A rather stout annual, with branching culms 1 to 2 feet long, and dense heads or spikes made up of 20 or more globular, spiny burs containing the spikelets. It is a weed of the fields and waste places of the Southern and Southwestern States.

Cenchrus tribuloides Linn. Sand-bur; Sand-spur; Hedgehog-grass; Bur-grass; Cock-spur Bur. (Fig. 27.)

A widely distributed grass growing in sandy soils along river banks, the seashore, and more or less scattered throughout the interior of the country in sandy districts. It is one of the worst of annual weeds wherever it becomes abundant.

FIG. 27.—Sand-bur. (*Cenchrus tribuloides.*)

FIG. 28.—Smooth Chloris. (*Chloris glauca.*)

The prostrate branching stems are 1 to 2 feet long, and the spikes are composed of 10 to 15 strongly spiny burs, which readily become detached and adhere to passing objects. No pains should be spared in efforts to exterminate this grass wherever it makes its appearance.

Chamæraphis sp. (See *Setaria.*)

Chloris barbata Sw.

This and the very similar *C. elegans* of our Southwestern States and Territories are pleasing ornamental grasses, growing to the height of 1 to 2 feet, the main stem and branches being terminated by 3 to 10 bearded spikes, which impart to them a striking appearance and make them valuable ornamentals. *C. polydactyla*, a West Indian species which has been found in southern Florida, is equally

attractive, and has longer and more graceful spikes. *C. barbata* appears to be the only one generally cultivated, but there are several native species which are quite as ornamental. *C. gracilis*, a native of Central America and Mexico, is another species occasionally cultivated for ornament.

Chloris glauca Vasey. Smooth Chloris. (Fig. 28.)

A strong-growing grass, with diffusely spreading and ascending stems, 2 to 4 feet long, bearing 10 to 25 slender terminal spikes. Native of Florida, growing on brackish marshes and along the borders of cypress swamps. This is a handsome species, well deserving the attention of the florist, and although not at present recognized as possessing any agricultural value, it produces a large amount of comparatively tender herbage and may prove to be a desirable fodder plant for certain localities along the Gulf coast. It has made a good growth under cultivation on clayey soil at Washington, D. C.

Chloris petræa Swz. Seaside Finger-grass.

This somewhat ornamental grass is found in damp soil along the coast from Florida to North Carolina. It has clustered, erect stems, 1 to 2 feet high, which are terminated with 3 to 5 rather slender spikes. Of no recognized agricultural value, but it is as attractive as many of the grasses grown in the gardens as ornamentals.

Chloris verticillata Nutt. Branching Foxtail; Windmill-grass.

A low, spreading perennial, with upright flowering branches 6 to 20 inches high. The small awned spikelets are in slender spikes, which are crowded near the apex of the stems, and become widely-spreading at maturity. This grass is common in many places in central Texas, New Mexico, Arizona, northward to Kansas, and by some is spoken of very highly as an excellent grass for grazing, and one not easily tramped out. The arrangement of the spikes gives the grass an odd and somewhat pleasing appearance, making it of some use as an ornamental species for gardens. It is a good turf-former.

Chloropsis blanchardiana. (See *Trichloris blanchardiana.*)

Chrysopogon nutans. (See *Andropogon nutans.*)

Chrysurus cynosuroides. (See *Lamarkia aurea.*)

Cinna arundinacea Linn. Indian Reed; Wood Reed-grass; Sweet Reed.

A tall, leafy grass, 3 to 7 feet high, native and frequent in shaded swamps and damp woods, or along streams in wet meadows. For such places it may possess some agricultural value, as it yields a large amount of excellent hay where growing abundantly.

Cinna pendula Trin. Slender Reed-grass; Drooping Reed-grass.

This grass resembles the above somewhat, but is usually more slender, the more nodding panicles fewer flowered, and it is, for the most part, confined to moist woodlands in the Northern States.

Coix lachryma Linn. Job's Tears; Tear-grass; Corn-beads.

This grass is a native of southern Asia and is occasionally cultivated in this country for ornament or as a curiosity. It is cultivated for food by some of the hill tribes of India, and supplies a staple article of diet of the Tankhul Nagas of Manipur. The female flowers of this grass are inclosed in a nearly globular, capsule-like covering, which is very hard and becomes nearly white with age. In some countries these capsules are used for dress ornamentation and by the Catholics for rosaries. In China this grass is cultivated to some extent, because the fruit is believed to be valuable as a diuretic and antiphthisis. It is a hardy annual, 2 to 3 feet high, with broad leaves and a curious, nodding inflorescence. The "seeds" may be obtained from any of the leading seedsmen.

Ctenium carolinianum Panz. Toothache-grass; Lemon-grass. (Fig. 29.)

A perennial grass with erect stems 3 to 4 feet high. Native of the Southern States from Virginia southward, growing in the wet pine barrens, possessing no agricultural value, but rather curious in appearance. The strong rootstocks are lemon-scented and have a pungent taste.

Cynodon dactylon Pers. Bermuda-grass; Reed-grass; Scutch-grass; Dog's-tooth-grass; Wire-grass; Bahama-grass; Indian Couch-grass; Doab, Doorba or Doorva (in India); Couch-grass (in Australia). (Fig. 30.)

A grass widely dispersed over the tropical regions and warmer countries of the globe. It has a creeping habit of growth, extending over the surface of the ground and rooting at the joints. In poor soils the leaves are short and the upright flowering stems are only a few inches high, but on good land it grows to the height

FIG. 29.—Toothache-grass. (*Ctenium carolinianum.*)

FIG. 30.—Bermuda-grass. (*Cynodon dactylon.*)

of 1 to 2 feet and yields a large amount of excellent hay. It may be cut three or four times during the season. In the Northern States it does not afford a profitable crop and is of little value for pasturage north of Virginia, but in the Southern States and in the warmer regions of the Southwest and on the Pacific Slope it is cultivated extensively and is most highly prized, chiefly for grazing, all kinds of stock being exceedingly fond of it. It grows freely on sandy soils where other grasses will not thrive, and resists extreme drought and high temperatures. It is particularly a sun-loving grass, and will not thrive in the shade. It is useful for binding drifting sands and the loose soil of embankments or those subject to wash. It makes a pleasing lawn grass, and is extensively used for this purpose in the hotter portions of the United States, for it will thrive where the grasses ordinarily employed for lawns could not survive. The

yield of hay under good conditions is from 3 to 4 tons to the acre, and as high as 10 tons to the acre have been produced under peculiarly favorable circumstances. While this grass will survive the winters of the latitude of Philadelphia, the leafage is very sensitive to cold and turns brown with the first frosts. This fact renders it objectionable as a lawn grass, except in regions where the winter season is very mild. In many portions of the Southern States there is probably no grass equal to Bermuda for summer pastures, and none which will better resist the trampling of stock. Bermuda does not mature seed except in the extreme southern portion of our country, but seed obtained from more southern latitudes is offered for sale by some of our leading seed dealers. The most direct and certain method of propagation is by transplanting, which may be effected by cutting up Bermuda turf into small pieces, scattering these along shallow furrows and covering them lightly. When once established, Bermuda grass is very persistent and difficult to eradicate, and it should not be introduced upon land which is likely to be used for other crops. New York catalogues quote the seed at $1.25 to $1.50 per pound, retail.

FIG. 31.—Crested Dog's-tail. (*Cynosurus cristatus.*)

Cynosurus cristatus Linn. Crested Dog's-tail. (Fig. 31.)

A slightly tufted perennial grass, 1 to 2 feet high, with fine and chiefly radical leaves. It is a native of Europe and is adapted to cultivation in moist, temperate regions, and has been sparingly introduced into this country. On moist, rich land it is fairly productive, but it is rarely sown alone, excepting for seed or the formation of lawns, for which latter purpose it is well adapted, as it forms a low and compact sward when thickly sown. It is said to thrive well in the shade, a fact which gives it importance to those desiring to form a lawn under shade trees. It forms a good bottom grass, has a highly nutritive value, and is recommended for all mixtures used for permanent pastures, especially in hilly regions. The mature stems of this grass are among the most valuable of those used in the manufacture of Leghorn hats. Price of seed in New York, 40 cents per pound, or $7.35 per bushel, which weighs about 21 pounds.

Dactylis glomerata Linn. Orchard-grass; Rough Cock's-foot. (Fig. 32.)

FIG. 32.—Orchard-grass. (*Dactylis glomerata.*)

This is one of the best known and among the most popular of our cultivated grasses. It will grow well on any soil containing a reasonable amount of fertility, excepting that which is very wet. It is a hardy grass and may be grown successfully anywhere in the United States, except in the extreme South and in the arid regions of the West. It yields an abundant crop of excellent hay and may be sown alone for this purpose, but owing to its habit of forming tufts or tussocks, the land should be seeded heavily or the seeds should be mixed with

other sorts, to act as fillers. It is a good pasture grass, especially for open woodlands, and affords excellent grazing earlier than almost any other species. The aftermath is unequaled in amount by any of the grasses ordinarily cultivated for hay. When sown with other grasses, the tendency of Orchard-grass to form tussocks is much diminished and the sward greatly improved. Heavy rolling is also recommended for checking or preventing the tufted growth which this grass naturally assumes. By this operation the tufts are pressed down to the level of the other grasses and the turf becomes more uniform. In old, rich meadows of Orchard-grass it is advisable to harrow in the spring and afterwards use the roller. Its best record of yield, made by Sinclair, was 27,905 pounds green, 11,859 pounds of hay, and 11,910 pounds of aftermath per acre. Sow 3 to 4 bushels to the acre. Price of seed, as given in New York catalogues, $2 to $2 50 per bushel, which weighs about 14 pounds.

Dactyloctenium ægyptiacum Willd. Crow-foot-grass; Egyptian-grass; Ah-ke-ti (Mohave Indians). (Fig. 33.)

This grass, which is a weed throughout all the warmer countries of the world, has become quite common in some of the Southern States. It closely resembles the more common Goose-grass or Duck's-grass (*Eleusine indica*), from which it differs chiefly in having the terminal spikes shorter and each tipped with a sharp prolongation of the axis. It is usually found in cultivated fields, and often in such abundance as to displace the less vigorous native sorts, and is sometimes cut for hay. In parts of Africa where this grass is common a decoction is prepared from the seeds, which is used for inflammation of the kidneys. In Australia it is valued for pasture, and in India the grain is sometimes used for food by the natives in times of scarcity. The Mohave Indians of California also use the grain for food, grinding it and making the flour into cakes or mush. (C. R. Orcutt.)

FIG. 33.—Crow-foot grass. (*Dactyloctenium ægyptiacum.*)

Danthonia californica Boland. California Oat-grass.

A native of the Rocky Mountain regions and Pacific Slope, growing from 1 to 3 feet high. The largest, most leafy, and handsomest of our American species of *Danthonia*, often forming a considerable element of the forage of the so-called deer parks of the mountains and foothills. Nothing is known of its agricultural value.

Danthonia compressa Austin. Tennessee Oat-grass; Mountain Oat-grass.

A slender, erect, tufted perennial, usually growing to the height of about 2 feet, with long and narrow root-leaves, and few-flowered spreading panicle. It is a common grass in the hilly regions of New England and the Middle States, and extends southward into North Carolina and Tennessee along mountains, where it forms the chief bulk of the forage of the so-called "balds" or parks which are common to mountains in the South. It is highly nutritious, as determined by chemical analysis, as well as by its effect upon the stock grazing upon it. It

stands well the trampling and grazing of both horses and cattle, but sheep are too close feeders, and where these range it soon disappears.

Danthonia cunninghamii Hook. f.

A large tussock grass of New Zealand, growing from sea level to an altitude of 2,500 feet. It has rather stout stems 3 to 6 feet high, and large, nodding panicles 10 to 18 inches long. A strikingly handsome ornamental grass, affording a large amount of coarse fodder. It is of value in the manufacture of paper. (Kirk.)

Danthonia flavescens Hook. f. Yellow Tussock; Snow-grass.

A stout grass 3 to 5 feet high, with leaves 3 to 4 feet long, and open panicles 10 to 18 inches long. Found only in New Zealand, growing chiefly in the mountain districts. It is rather coarse for fodder, but serves for winter grazing, and the leaves are largely used in paper mills and for thatching (Kirk). The leaves of the less robust *D. raoulii*, also a native of New Zealand, are used for similar purposes.

Danthonia pilosa R. Br.

A slender and rather rigid tufted perennial 1 to 2 feet high, with very narrow or filiform leaves and contracted panicles 2 to 3 inches long. A native of New Zealand and Australia. Mr. T. Kirk says of this grass that it is excellent for mixed pasturage, forming a compact turf. It is very hardy, of rapid growth after cropping, and affords a good yield of nutritious herbage.

Danthonia semiannularis R. Br. Wallaby-grass.

A somewhat variable grass, 2 to 3 feet high, native of Australia, occurring both in the coastal districts and in the arid interior. It is a perennial and is said to be one of the most nutritious grasses of Australia, stock of all kinds being remarkably fond of it. If cut when just coming into flower it makes good hay. It grows on a great variety of soils, but is most productive on moderately rich, strong loams. It seeds freely, and the grain is easily harvested.

Danthonia sericea Nutt. Silky Oat-grass; Taller Wild Oat-grass; Silky-flowered Oat-grass.

This is a rather stout, erect grass, 1 to 3 feet high, with usually pubescent sheaths and rather rigid leaves. It ranges from Massachusetts southward to Tennessee and North Carolina in the mountain regions, where it occurs along the lower foothills and crests of the higher ridges. It grows in isolated tufts, and is comparatively rare. Of no agricultural value.

Danthonia spicata Beauv. Wild Oat-grass; White-top; Old Fog; June-grass; Poverty-grass. (Fig. 34.)

This is our most common species of *Danthonia*, extending from Canada southward to the Gulf of Mexico. It grows in dry and sterile or rocky soil, and its presence is usually indicative of impoverished lands. In New England it frequently occupies neglected fields, as broom sedge does in the South. It is a grass of no agricultural value.

Danthonia unispicata Thurb. Mountain Oat-grass.

This is a low grass, 6 inches to a foot high, usually associated with California Oat-grass, being confined to similar regions, where it helps to make up the herbage of the mountain meadows and parks.

Deschampsia cæspitosa Beauv. Tufted Hair-grass; Hassock-grass.

A native perennial, ranging from New England to Pennsylvania, and westward to the Pacific Coast. It yields an inferior, coarse, harsh forage, and is not eaten by stock except when young. It has a record of producing 10,209 pounds green and 3,318 pounds dry hay per acre. Johnson, in his work on British grasses, says of the tendency of Tufted Hair-grass to form tussocks: "In the economy

of nature these tufts, so unsightly and disfiguring to the landscape, are valuable by contributing to elevate and solidify low lands liable to be overflowed by rivers, and where they occur on hill and mountain slopes, by binding the spongy soil and preventing the slips which would leave them bare." This grass is most abundant in the Rocky Mountain region, where it doubtless serves to a considerable extent the purpose here mentioned. In England it is sometimes used by the farmers to make door mats. In Germany it furnishes the "Lime-grass" used in upholstery. Price of the seed in New York, $22 per 100 pounds.

Deschampsia cæspitosa var. Rocky Mountain Hair-grass.

An ornamental grass like the last (*D. cæspitosa*), growing in tufts, but bearing fewer flowering stems and many more and longer (18 inches) dark-green leaves. After cutting, on August 5, new leaves were thrown up so quickly that in one week the plot was green again. (James Fletcher.)

FIG. 34.—Wild Oat-grass. (*Danthonia spicata.*)

FIG. 35.—Tufted Hair-grass. (*Deschampsia flexuosa.*)

Deschampsia flexuosa Griseb. Tufted Hair-grass; Wood Hair-grass. (Fig. 35.)

A slender perennial grass, 1 to 2 feet high, with numerous very fine root-leaves and a delicate capillary panicle. It grows in tufts like *Deschampsia cæspitosa*, and is more common in the Eastern States than that species, but is even less valuable for meadows. It is, however, of some value for woodland pastures, as it will grow very well in the shade. It extends southward along the mountains into North Carolina and Tennessee. Its range westward is limited. It has a record of producing 12,209 pounds of green, and 3,318 of dry hay per acre. The price of seed quoted in New York catalogues is $15 per 100 pounds.

Desmazeria sicula Dum.

A native of the Mediterranean region, frequently cultivated for ornament. Used for edging.

Deyeuxia. (See *Calamagrostis.*)

Deyeuxia canadensis. (See *Calamagrostis canadensis.*)

Diarrhena americana Beauv. Twin-grass.

An erect native perennial, 2 to 3 feet high, with long, rather broad, nearly erect leaves, and few-flowered, simple panicles, 4 to 10 inches long. This grass grows along shady river banks and in rocky woods from Ohio to Illinois and southward. Of no agricultural value.

Diplachne fascicularis Beauv. Spike-grass.

An annual, 2 to 3 feet high, ranging from New England southward, and westward to Arizona. It is chiefly confined to brackish marshes or wet lands near the coast, and low, more or less alkaline regions in the interior. Of no recognized agricultural value.

FIG. 36.—Salt-grass. (*Distichlis maritima.*)

FIG. 37.—Yard-grass. (*Eleusine indica.*)

Distichlis maritima Rafin. Salt-grass; Alkali-grass; Spike-grass; Quack-grass. (Fig. 36.)

An upright, wiry grass, 10 to 20 inches high, with strong, extensively creeping rootstocks. Common along the coast on both sides of the continent, and abundant in the alkaline regions of the interior, where it is often found covering considerable areas to the exclusion of other grasses. It thrives even in ground heavily crusted with alkali and other salts sufficient to destroy almost any other kind of vegetable growth. Prospectors and miners consider its presence a sure sign of water near the surface, and when crossing the desert select spots where it grows to dig for water (Orcutt). In farming lands it is deemed a nuisance, for its tough, matted roots make a sod almost impossible to break up with a plow. Although sometimes eaten by stock in the absence of better sorts, it has

little agricultural value. It is a good grass for binding loose sands or soils subject to wash.

Eatonia obtusata Gray. Early Bunch-grass; Prairie-grass.

A tufted perennial, 1 to 2 feet high, with flat leaves and rather densely flowered nodding panicles. This is a native species, growing usually in moist soil, and ranging from New York to California and southward. A tender grass, readily eaten by stock, which, when abundant, supplies considerable native forage of good quality.

Eatonia pennsylvanica Gray. Eaton's-grass.

A slender, pale-green perennial, not infrequent in moist meadows in the States of the Atlantic Slope. Tender and nutritious, and well adapted for cultivation in moist meadows.

Eleusine ægyptiaca. (See *Dactyloctenium ægyptiacum.*)

Eleusine coracana Gærtn. African Millet; Ragi Millet; Korakan, Dagassa, and Mandua are Indian names for this grass.

An erect annual grass, 2 to 4 feet high, closely related to and much resembling our common crowfoot (*Eleusine indica*), but of rather stouter habit and with larger spikes and seeds. It is cultivated in India, southern China, Japan, and in many parts of Africa for the grain, which is used as food. It forms the principal food of many African tribes. In spite of the bitter taste of the flour, a kind of bread or unleavened cake is made of it. Beer is brewed from the grain in Abyssinia. Said to yield good crops, even on very poor soil, and may be cultivated in the same way and for the same purposes as millet. The seeds are marked with very fine, comb-like lines.

Eleusine indica Gærtn. Goose-grass; Dog's-tail-grass; Yard-grass; Crow-foot-grass; Wire-grass; Crab-grass; Crop-grass; Dog's tooth-grass; Buzzard-grass; Dutch-grass. (Fig. 37.)

A coarse, tufted annual, with erect or spreading stems 6 inches to 2 feet high; spikelets arranged in a number of spikes which are clustered at the top of the stem. This grass is distributed throughout the warmer countries of the globe, and is particularly abundant in the Southern States, growing in cultivated grounds about dwellings, etc. It has somewhat wiry, flattened stems, many springing from a single root, and rather thick leaves. Some authors have spoken of it as being nutritious and good for grazing or soiling, and for hay, but it is more generally regarded as a weed, and often a troublesome one in door-yards or lawns.

Elionurus hirsutus Munro.

A perennial grass with rigid stems 1 to 2 feet high and slender, silvery-hairy terminal spikes. A characteristic desert-grass of northwest India. It yields a fodder for elephants, and the seed, mixed with bájra flour, is largely consumed by the natives. (Duthie.)

Fig. 38.—Upright Sea-Lyme-grass. (Elymus arenarius.)

Elymus arenarius Linn. Sea Lyme-grass; Upright Sea-Lyme-grass. (Fig. 38.)

A stout, coarse grass, 2 to 8 feet high, with strong, creeping rootstocks, smooth stems, long, rigid leaves, and dense terminal spikes 6 to 12 inches long. The spikelets are about an inch long and three to four flowered. This grass is common along the seacoast of northern Europe, our north Atlantic coast, and on

our Western shores from Santa Cruz, Cal., northward to within the Arctic zone. It is one of the best grasses known for binding the drifting sands of the coast and in northern Europe has been cultivated along with Beach-grass for this purpose. These two grasses, when combined, seem admirably adapted for the purpose of forming a barrier to the encroachment of the sea; the sand that Beach-grass arrests and collects about itself the Lyme-grass secures and holds fast. The seeds are used for food by the Digger Indians of the Northwest, and as the grass springs up around their deserted lodges it is called by the settlers "*Rancheria*" grass. This Lyme-grass is usually regarded as possessing little or no forage value, but in very moist climates or under certain favorable conditions it may yield a valuable fodder, for when young the grass is tender and nutritious.

Elymus canadensis Linn. Wild Rye; Terrell-grass; Canada Lyme-grass.

A rather stout, smooth perennial, 3 to 5 feet high, with broad, flat leaves, 6 to 12 inches long. The bearded spikelets are arranged in a terminal spike or "head," which has some resemblance to a head of rye. Common in low thickets and along streams in rich, open woods throughout the country. It has no recognized agricultural value, but its cultivation is evidently worthy of trial, for if it could be successfully grown its yield of hay would be large, and from appearances the hay would be of good quality.

FIG. 39.—Terrell-grass. (*Elymus virginicus.*)

Elymus condensatus Presl. Giant Rye-grass; Rye-grass; Western Rye-grass.

The largest of the native Rye-grasses, growing to the height of 5 to 10 feet. Common in the Rocky Mountain regions and on the Pacific Slope, usually growing along rivers or streams, the banks of which are protected and held together by the strong, spreading rootstocks of the grass. This grass is useful for holding the sand on railway banks, etc. When young, this grass makes excellent hay, and when allowed to stand it affords a considerable amount of fodder for stock on the winter ranges.

Elymus hystrix. (See *Asprella hystrix.*)

Elymus mollis Trin. Soft Sea Lyme-grass.

A grass which closely resembles and has the same habit of growth as *Elymus arenarius*. It is distinguished by having the stem soft-downy just below the head or spike and in having five- to seven-flowered spikelets, the outer glumes of which are broader and five- to seven-nerved. This grass occurs along the shores of the Great Lakes and northward on both the Atlantic and Pacific coasts.

Elymus striatus Willd. Dennett-grass; Slender Hairy Lyme-grass.

A slender perennial, 2 to 3 feet high, with bristly, nodding spikes or heads. A native grass found in moist thickets, along streams, etc. Of no recognized agricultural value.

Elymus triticoides Nutt. Wild Wheat; Wild Rye.

By some this has been regarded as a small, reduced form of *Elymus condensatus*, mentioned above. It grows to the height of 2 to 3 or 4 feet and is native of the Rocky Mountain region and Pacific Slope, extending eastward nearly to the Mississippi. While it is a grass of good appearance and possibly of some agricultural value, no attempts have been made to cultivate it.

Elymus virginicus Linn. Lyme-grass; Smooth Rye-grass; Terrell-grass; Wild Rye; Virginia Lyme-grass. (Fig. 39.)

The most common of our native species of Lyme-grasses, growing along streams, the borders of woods and thickets, more rarely in the open ground. It is an erect, smooth grass, 2 to 3 feet high, with rigid terminal spikes, which are often partly included within the upper leaf sheath. This grass has the appearance of possessing some agricultural value, but forms no turf, and by the time it blooms all the lower leaves are usually dead. When young it doubtless possesses some value as a native pasture grass.

Epicampes rigens Benth. Deer-grass. (Fig. 40.)

A stout, erect grass, 3 to 4 feet high. with rigid, wiry stems, and a very long, narrow, densely flowered, spike-like panicle. This grass is not uncommon in Arizona, southern California, and New Mexico, growing in sandy soil. It is regarded as one of the best native dry-land grasses, and is closely grazed wherever stock can get at it. The roots of *Epicampes macroura*—Mexican Broom-root or Mexican Whisk—are used in making brushes and are exported from Vera Cruz to Europe for this purpose.

Eragrostis abyssinica Link. Teff.

A branching, leafy annual, 2 to 4 feet high, with widely spreading capillary panicles of many spikelets. This grass grows readily from seed, which is produced abundantly, and it may be of some value for hay in parts of the South or Southwest. In northeastern Africa, where the grass is apparently native, the grain is extensively used for food, being made into bread, which possesses a slight but agreeable acid taste. There are two varieties cultivated, a white and a red variety, the former being much superior to the latter and used only by the higher classes. It is sometimes grown in gardens for the elegant panicles, which are used in bouquets. A species of *Eragrostis*, possibly *E. neo-mexicana* Vasey, with the general habit of growth of Teff, occurs in New Mexico, springing up after rains, particularly in the region about Silver City, where it is called "Crab-grass." It is an annual, growing to the height of 2 to 4 feet, with widely spreading, many-flowered panicles, and is largely cut for hay.

Eragrostis amabilis. Love grass.

A native of India, closely related to Candy-grass (*Eragrostis minor*). Cultivated sometimes in gardens for bouquets.

Eragrostis ciliaris Link.

A low, much-branched species with narrow, densely flowered, almost spike-like panicle. Florida to Mexico and South America. This and *E. plumosa*, which has open panicles and is of rather more slender habit, are pretty little ornamental species which might be cultivated for bouquets.

Eragrostis cynosuroides R. & S.

A rather stout, leafy perennial, 1 to 3 feet high, with narrow, spike-like panicles and rather large spikelets, common in northern India. Although a hard grass, it is sometimes used as fodder, mixed with gram (*Cicer arietinum*) and wheat, when other grasses fail. It produces a strong fiber which is much used for making ropes. This grass is considered sacred among the Brahmins. It is often spread

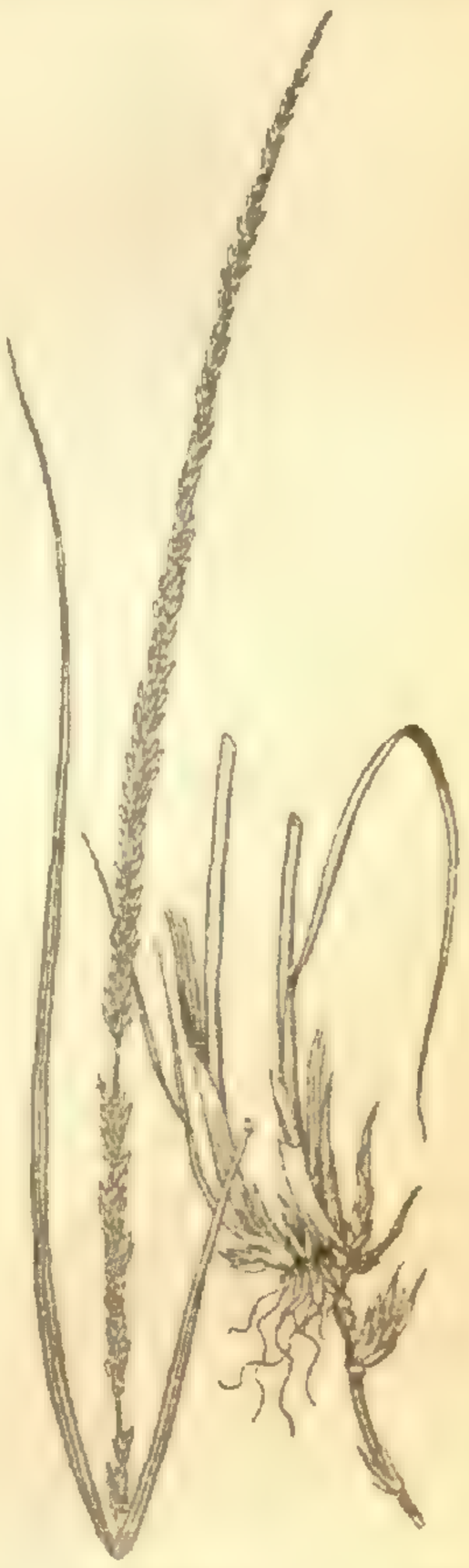

FIG. 40.—Deer-grass. (*Epicampes rigens.*)

beneath the dead bodies of Hindoos, the chief mourner wearing a ring of it on his finger. The stout rhizome is used as a diuretic. (Duthie.)

Eragrostis elegantula Kunth.

A smooth, annual grass, 1 to 3 feet high, native of northwest India, growing in low, swampy grounds. It yields palatable fodder, and in the central provinces at Balaghat it is used for brooms.

Eragrostis frankii Meyer. Short-stalked Meadow-grass.

A low, tufted annual, 3 to 10 inches high, rather common in the Central and Southern States, growing in low, sandy ground along streams, marshes, or ponds. When fresh it has a very strong, disagreeable odor, which serves at once to distinguish it. It has no agricultural value.

Eragrostis major Host. Stink-grass; Pungent Meadow-grass. (Fig. 41.)

A rather showy, much-branched annual, with erect or ascending stems, 6 inches to 2 or 3 feet high. This species, which is a native of Europe, has become widely distributed in this country, growing chiefly in cultivated or waste grounds, especially in light soils. When fresh it emits a strong, unpleasant odor.

FIG. 41.—Stink-grass. (*Eragrostis major.*)

Eragrostis minor Host. Candy-grass; Strong-scented Meadow-grass; Stink-grass.

This grass closely resembles *Eragrostis major*, but is smaller throughout, having narrower, usually fewer-flowered spikelets. It grows in similar situations as the last, but is less common.

Eragrostis pectinacea Gray. Meadow Comb-grass.

An erect perennial, 1 to 2 feet high, with large, widely-spreading panicles, 6 inches to a foot or more in length. A native grass, common in dry, sandy soils in open grounds and along the borders of fields and woods in the Eastern, Southern, and Middle States. The showy panicles are often gathered for dry bouquets. Of no agricultural value.

Eragrostis pilosa Linn. Slender Meadow-grass.

A slender branching annual, 6 to 18 inches high, with narrow, flat leaves and capillary, open panicles. This grass is widely distributed throughout the subtropical and warmer temperate regions of both hemispheres. In this country it has received no attention or is regarded as little more than a weed, but in Australia and India it is spoken of as being an excellent fodder grass, and the seeds are eaten by the natives of Ajmere, India.

Eragrostis purshii Schrad. Southern Spear-grass; Southern *Eragrostis.*

A native annual, similar in appearance to *Eragrostis pilosa*, and growing in similar situations. It is common from the Middle States southward, and extends southwestward into Texas and Arizona, where it exists in a great variety of forms. It grows to the height of 1 to 2 feet. It is nowhere considered of any agricultural importance.

Eragrostis reptans Nees. Creeping Meadow-grass.

A prostrate, much-branched and extensively creeping annual, common along sandy river banks, lake shores, and in marshy places. It sends up flowering stems 3

to 6 inches high, and from its habit of growth often presents a moss-like appearance. Of no agricultural value.

Eragrostis tenuis Gray. Branching Spear-grass.

This is a tall perennial western species 3 to 4 feet high, with long, open panicles and rather rigid leaves, which are 18 inches to 2 feet long. It grows in sandy soil in scattered tufts. Of no agricultural value.

Eremochloë. (See *Blepharidachne.*)

Erianthus ravennæ Beauv. Plume-grass.

A stout grass growing to the height of 8 or 10 feet, with large and plume-like panicles 10 to 20 inches long, resembling in some degree Pampas grass. Cultivated for lawn decorations, as is also the variety with variegated leaves. A native of the Mediterranean region.

Erianthus saccharoides Michx. Plume-grass; Woolly Beard-grass; Foxtail.

A tall, stout grass of striking appearance, 4 to 6 feet high, with a reddish or silvery-white showy panicle from 5 to 10 inches long. This grass ranges from New Jersey to Illinois and southward to the Gulf, growing in very wet places and open swamps. Of no agricultural value, but deserves notice as an ornamental grass for lawns and gardens.

Eriochloa aristata Vasey. Mexican Everlasting-grass.

A branching leafy annual, 2 to 3 feet high, native of Mexico. Seed of this grass was obtained by the Department in 1888, and it was cultivated in the grass garden located at Starkville, Miss., by Prof. S. M. Tracy, who says that it is a much more promising grass than *E. annulata*, more hardy, less injured by drought, and produces a heavier growth. It will make two good crops of hay annually in the South, the best crop being from the second growth, which is ready to cut in October. The grass produces an abundance of seed and reseeds itself, making its production comparatively inexpensive.

Eriochloa punctata Hamilt. Everlasting-grass; Early Spring-grass.

A quick-growing, smooth, succulent perennial, 2 to 3 feet high, with flat leaves and narrow panicles 2 to 4 inches long. Widely distributed within the tropical and subtropical regions of both hemispheres. In Australia it is regarded as an excellent pasture grass, lasting all the year round and well liked by stock. The seed, which is produced abundantly, is easily gathered. This grass deserves the attention of Southern dairymen. In Arizona it grows throughout the valleys in irrigated soil, or in the rich, moist places of the plains, yielding abundant herbage eagerly sought by all kinds of stock.

Eriocoma cuspidata. (See *Oryzopsis membranacea.*)

Euchlæna luxurians. (See *E. mexicana.*)

Euchlæna mexicana Schrad. Teosinte; Guatemala-grass.

A stout, leafy annual grass, 8 to 10 or 12 feet high, resembling Indian corn, to which it is botanically closely related. The variety *E. luxurians*, of the seed catalogues, which has been cultivated in various parts of the South and West, has a habit of tillering, or sending up many—20 to 50—stalks from the same root. From this habit the bulk of fodder produced to the acre is very large, probably unequaled by any other grass. It is liked by all kinds of stock, and has especial value as a green fodder when other forage is dried up. It may be cut several times during the season, but nearly as good results will be obtained from a single cutting, made before there is any frost. The stalks are tender, and there is no waste in the fodder when dry or green. One pound of seed to the acre planted in drills 3 feet apart and thinned to a foot apart in the drill, is recommended. It is a native of the warmer portions of Mexico and Central America. The seed rarely matures north of southern Florida.

Eulalia japonica. (See *Miscanthus sinensis.*)

Eustachys petræa. (See *Chloris petræa.*)

Festuca duriuscula Lam., Hard Fescue; Tall Sheep's Fescue.

A slender, densely tufted perennial grass, 1 to 2 feet high, with numerous very fine radical leaves and open panicles. This is one of the forms of Sheep's Fescue, and is of little value except in pastures. Its particular merit lies in its ability to thrive on dry, sandy soils unfit for the growth of better grasses, and it well resists long periods of summer drought. It is well adapted to the cooler and mountainous regions of our country, being a native of the cooler temperate regions of both hemispheres. On well-manured, clayey land this Fescue has produced upon a single acre 18,376 pounds of green hay at time of flowering, and 8,269 pounds of hay besides 10,029 pounds of aftermath. It possesses some value as a lawn grass, but if used for this purpose it should be sown thickly and unmixed with other sorts. Sow 2½ to 3 bushels to the acre. Price of seed in New York markets, $16 to $18 per 100 pounds.

Festuca elatior Linn. Tall Fescue; Tall Meadow Fescue; English Blue-grass; Randall-grass; Evergreen-grass.

This grass has been widely cultivated in this country, having been introduced from Europe, and has become thoroughly naturalized. It is an exceedingly valuable grass either for mowing or pasture. It is productive on soils which are not too dry, and being of long duration, is especially valuable for permanent pastures. It thrives best on moist soils rich in humus, whether marls or clays. The variety *pratensis* is a common form, rather smaller than the species, with a narrower and fewer-flowered panicle. Variety *arundinacea* (fig. 42) is a very vigorous, tall form, 3 to 4 feet high, exceedingly hardy, and yields a very large amount of hay of excellent quality, succeeding best on lands that are comparatively moist. The seed of Meadow Fescue is quoted in some of the New York catalogues at $3.50 per bushel or $22 per 100 pounds. A bushel weighs about 14 pounds.

FIG. 42.—Reed Fescue. (*Festuca elatior* var. *arundinacea.*)

Festuca glauca Hort.

A low grass, similar in its habit of growth and botanically closely resembling *Festuca ovina*, and by many authors regarded merely as a variety of that species. Owing to its pale, glaucous color and densely tufted manner of growth, it makes an attractive plant for edgings and is much used for that purpose by florists.

Festuca heterophylla Lam. Various-leafed Fescue.

A rather slender European grass, 2 to 4 feet high, with very narrow (setaceous) radical leaves, and narrow but flat culm leaves. It is a perennial, closely related to creeping Fescue, of which it has been made a variety by some authors. The panicle is comparatively large, open and nodding at the apex. It is a species preferring a rather mild climate and grows naturally in open woodlands or along their borders. It makes its best growth on low-lying lands which are not too dry, but upon good soil it withstands very well protracted periods of

drought. Owing to the great production of fine root leaves, this species makes a good bottom grass, and as these leaves are quite soft the grass is well adapted for lawns, and is particularly recommended for those which are too much shaded for the successful growth of other lawn grasses. It is an excellent grass, also, for woodland parks where the soil is not sandy, and European authorities have classed it with the best forage plants. It is little known in this country, but the seed is offered for sale by our leading seedsmen, the retail price being from $2.50 to $3 per bushel of about 14 pounds.

Festuca littoralis Steud.

A native of the seacoasts of Australia and New Zealand. It is a hardy grass, 1 to 3 feet high, with erect, rigid leaves and narrow panicle 3 to 10 inches long. It is found only upon the loose sand, and is of no value for fodder, but the tough, fibrous herbage is excellent for paper making, and the densely tufted habit of growth renders the species useful for binding drifting sands.

Festuca microstachya Nutt. Western Fescue; Small Fescue.

This is a low native annual species of the Rocky Mountain region and the Pacific Slope. It has no agricultural value.

Festuca nutans Willd. Nodding Fescue.

A native grass, 1 to 4 feet high, with a loosely flowered, nodding panicle and perennial root. It is found in moist, open woods and along thicket borders. It has no recognized agricultural value.

Festuca ovina Linn. Sheep's Fescue; Piñon-grass (in Nevada); Pine Bunch-grass.

Sheep's Fescue exists in many varieties in the Northwestern States, especially in the Rocky Mountain regions. Some of these varieties attain the height of 2 or 3 feet, but for the most part they are rarely more than a foot high, producing a large amount of fine herbage, which is valuable for grazing, especially for sheep. Some of the native varieties are well worthy the attention of the agriculturist. All the forms of *Festuca ovina* are "bunch-grasses," and are devoid of the creeping roots, the presence of which distinguishes the Red Fescue (*Festuca rubra*) from this species. Sheep's Fescue is well adapted for cultivation on light, dry soils, especially those which are shallow and silicious. Although a native of this country, our seed supply comes mostly, if not entirely from Europe, where the grass is also native. Sow 2½ to 3 bushels per acre. The weight of a bushel of seed is about 14 pounds. Price per bushel $2.25 to $2.75.

FIG. 43.—Tennessee Fescue. (*Festuca rubra* var. *glaucescens*.)

Festuca pratensis. (See *Festuca elatior*.)

Festuca rubra Linn. Red Fescue; Creeping Fescue.

This grass grows along the Atlantic coast of the New England and Middle States, and in the Northern States, extending westward to the Pacific. Like *Festuca ovina*, it presents many forms, but in some respects is superior to that species, as by its creeping rhizomes it will form a compact and durable turf. On account of this habit of growth, it is a useful grass for binding moving sands along the seacoast, or covering gravelly banks and dry slopes. In Germany, Red Fescue is regarded as one of the most valuable grasses for dry, sandy meadows and

pastures. A vigorous-growing variety of *Festuca rubra* (var. *glaucescens*) (fig. 43) grows in Tennessee, where it remains green throughout the year, being little affected by drought or severe winter weather. This form grows to the height of 1 to 2 feet, and has a great mass of fine and long root leaves, and may be recommended for pastures, especially upon worn-out soils and hilly slopes. Some of the varieties which are native in the Rocky Mountain region attain the height of 2 feet, and in the mountain parks and on the foothills they often cover areas of considerable extent with a beautiful and continuous turf, yielding pasturage of most excellent and nutritive quality. Sow 2½ to 3 bushels of seed per acre. A bushel weighs about 14 pounds. Price, about $2.75 per bushel.

Festuca scabrella Torr. Buffalo Bunch-grass; Great Bunch-grass. (Fig. 44.)

A strong perennial, growing in large tufts or bunches 1 to 3 or 4 feet high. A native of the Rocky Mountain regions, extending from Colorado northward and westward to California and Oregon. It often occupies extensive mountain parks, to the exclusion of other grasses, where it affords excellent grazing. It may be cut for hay, of which it furnishes a large amount, excellent in quality, especially for horses. It is one of the best grasses for winter stock ranges. In the Northwest, particularly in the Rocky Mountain region, there are many native species of the genus *Festuca* which are well deserving the attention of stockmen and farmers.

FIG. 44.—Buffalo Bunch-grass.
(*Festuca scabrella.*)

Festuca tenella Willd. Slender Fescue.

This is a low, annual species, 6 to 18 inches high, growing in poor, sandy soils in nearly all parts of the country. It possesses no agricultural value.

Festuca tenuifolia Sibth. Slender Fescue.

A low and fine-leafed grass, in habit of growth resembling *Festuca ovina*, of which it is regarded as only a variety by most authors. It has no special agricultural value, but will grow in dry and comparatively sterile soil. Its fine, hair-like leaves and densely cespitose habit of growth render it a good lawn grass when properly treated, especially for shady places, and it is also a good plant for edgings.

Festuca unioloides. (See *Bromus unioloides.*)

Gastridium australe Beauv. Nit-grass.

A showy, annual grass introduced into this country from Europe. It is cultivated for ornament only. On the Pacific Slope it has escaped from cultivation and has apparently become naturalized in many places.

Glyceria aquatica Smith. Reed Meadow-grass; White Spear-grass; Water Meadow-grass.

A stout, erect, leafy perennial, 3 to 4 feet high, with long, rather broad leaves, and a large, nodding panicle. It is common in the northern Middle States and southward along the mountains to Tennessee and North Carolina, extending westward to the Rocky Mountain region. It grows along streams and in moist meadows, and in such places often forms a considerable portion of the native hay. It is liked by cattle and is a good pasture grass for wet lands.

Glyceria canadensis Trin. Rattlesnake-grass; Tall Quaking-grass. (Fig. 45.)

A grass similar in habit to the last and growing in similar situations in the Northern States, extending southward to Pennsylvania and westward to Kansas. It is less common than *G. aquatica*, and has received no attention by the agriculturist. The nodding panicles of rather large spikelets are sometimes gathered for dry bouquets.

Glyceria fluitans R. Br. Floating Manna-grass; Common Manna-grass. (Fig. 46.)

This grass grows to the height of from 3 to 5 feet, and has a narrow panicle composed of rather few long and narrow or cylindrical spikelets. It is a cosmopolitan species, found in all temperate regions of the world, and is regarded as one of the best fodder grasses for swampy meadows. In some parts of Europe the seeds are gathered and used for human food in the form of soups and gruels.

FIG. 45.—Rattlesnake-grass. (*Glyceria canadensis.*)

FIG. 46.—Manna-grass. (*Glyceria fluitans.*)

Glyceria maritima Wahl. Sea Spear-grass; Creeping Sea Spear-grass; Creeping Sea Meadow-grass; Goose-grass.

A slender grass, 12 to 18 inches high, with creeping rhizomes. It occurs in the marshes along the seacoasts of New England and the Middle States, and forms a valuable element of the hay of tide-water marshes.

Glyceria nervata Trin. Fowl Meadow-grass; Meadow Spear-grass; Nerved Manna-grass. (Fig. 47.)

A leafy perennial, 1 to 3 feet high, with expanded nodding panicles of small spikelets. This is a common species in low meadows and moist grounds, extending from New England southward to the Gulf States, and westward to the Pacific Coast. It is a good fodder plant for moist meadows. Varies greatly in size, according to soil and location.

Glyceria pallida Trin. **Pale Manna-grass.**

A slender semiaquatic, with stems 1 to 3 feet long. Found in very wet places along the margins of ponds and slow streams, ranging southward from Canada to Tennessee. Rarely sufficiently abundant to form any considerable element in the native forage.

Gymnopogon brevifolius Trin. Short-leafed Beard-grass.

A slender, wiry grass, growing in dry, sandy soils along thickets and in open pine woods from Delaware southward to Florida. It is a grass of no agricultural value.

Gymnopogon racemosus Beauv. Naked Beard-grass.

Similar to the last, but of stouter growth and with broader leaves. Found in similar situations but more common, extending from New Jersey southward and westward to the Mississippi.

FIG. 47.—Fowl Meadow-grass. (*Glyceria nervata.*)

Gymnothrix caudata. (See *Pennisetum macrourum.*)

Gymnothrix latifolia. (See *Pennisetum latifolium.*)

Gynerium argenteum Nees. Pampas-grass.

A stout perennial, 8 to 12 feet high, with mostly radical, narrow leaves 3 to 6 feet long, and showy, silvery white or rose-red panicles 15 to 30 inches long. A much-prized ornamental for lawn decoration. The handsome panicles are used for dry bouquets. Growing Pampas plumes is an important industry in some parts of California. These plumes or panicles are cut when exposed only a few inches from the leaf sheath, then dried, and done up into bundles for shipment. Pampas-grass is a native of southern Brazil and Argentina, and there the long leaves are used for paper making, and a decoction of the rhizome is used as a diuretic. *G. roseum* is a horticultural variety, with pale, rose-colored plumes. *G. variegatum* is a form with variegated leaves.

Hemarthria compressa. (See *Rottbœllia compressa.*)

Heteropogon contortus. (See *Andropogon contortus.*)

Hierochloë borealis. (See *Hierochloë odorata.*)

Hierochloë odorata Wahl. Vanilla-grass; Seneca-grass; Holy-grass; Sweet-grass. (Fig. 48.)

A rather slender, sweet-scented perennial, 1 to 2 feet high, with short culm leaves and brownish panicles. Moist meadows and mountains of the Northeastern States, extending westward to Oregon. This grass, remarkable for its fragrance, has long, creeping rhizomes, from which spring the flowering culms and numerous long-leafed sterile or flowerless shoots. These long leaves are woven into small mats and boxes by the Indians, and find a ready market because of the sweet odor, which they retain for a long time. This odor resembles that of sweet vernal grass, but is more powerful, especially when dry. In some European countries it is believed to have a tendency to induce sleep, and bunches of it are hung over beds for this purpose. It makes a good turf, but is useless for forage.

Hilaria cenchroides H. B. K. Running Mesquit; Creeping Mesquit.

A delicate, perennial grass with slender, creeping stems, the upright, leafy shoots a

few inches to nearly a foot high. This is one of the most valuable of the grasses of the dry plains and mesas of the Southwest. It forms a dense, green sward, and in habit of growth closely resembles the true Buffalo-grass. It may be propagated by the runners as well as by seed. In some parts of Mexico a decoction of the grass is a popular remedy for purifying blood, especially in cases of skin diseases.

Hilaria jamesii Benth. Black Bunch-grass; "Guyetta;" Gietta.

This is a rather coarse perennial, with creeping rootstocks, and stems 12 to 18 inches high. It is common on the dry mesas of New Mexico and Arizona, extending eastward into Texas and Indian Territory. Where abundant it is regarded as one of the most valuable native grasses and furnishes excellent pasturage at all times when not covered with snow, and is frequently cut for hay. The closely

FIG. 48.—Sweet-grass. (*Hierochloë odorata.*)

FIG. 49.—Gietta-grass. (*Hilaria rigida.*)

allied *Hilaria mutica* grows in Arizona, forming dense patches of greater or less extent on hillsides, mesas, and plains. It is called "Black grama," and is largely gathered for hay, being uprooted with a hoe. (Pringle.)

Hilaria rigida Scribn. Guyetta, or Gietta grass. (Fig. 49.)

In the driest regions of southern California and Arizona, growing in the deserts where other grasses are rarely if ever seen. This grass is known to the natives as "guyetta" or "gietta" grass. It has coarse, much-branched, and woody stems, 2 feet high or more, growing in great clumps, resembling in its habit some of the dwarf bamboos. The stems and leaf sheaths are clothed with a dense, white-matted pubescence, which gives to the grass a peculiarly striking appearance. In the regions where it grows it is regarded as valuable forage for pack animals and mules, there being little other vegetation which they can

eat. Without this grass miners and prospectors would find great difficulty in traversing the arid mountain and desert regions of the Southwest, since scarcely any other forage plants occur in the districts occupied by "the gietta." (Orcutt.) The Hilarias, of which we have four species, are grasses peculiarly adapted for growth in the drier and nonirrigable lands of the Southwest, and although they are, with the exception of *Hilaria cenchroides*, wiry and tough, the forage they afford is very acceptable in the absence of more succulent plants.

Holcus lanatus Linn. Velvet-grass; Velvet Meadow Soft-grass; Velvet Mesquit; Velvet Lawn-grass; Meadow Soft-grass; Woolly Soft-grass; White Timothy; Yorkshire White; Yorkshire Fog; Salem-grass; Feather-grass; Calf-kill; Hungarian Blue-grass. (Fig. 50.)

A perennial, 1 to 2 feet high, with a creeping rootstock, clothed all over with a soft, whitish pubescence. This grass has been introduced into this country from Europe, and has become naturalized in many places. It possesses little nutritive value, and is not well liked by stock, particularly horses. It possesses some value, however, on peaty or sandy soils where the better grasses will not grow. Its cultivation, however, is not recommended. It is entirely unsuited for lawns.

Holcus mollis Linn. Creeping Soft-grass.

Closely allied to Velvet-grass,and said to be similarly well adapted to light, sandy, forest lands. It is occasionally found in the Eastern States, the seed having been introduced with that of other grasses from Europe, as both *Holcus mollis* and *Holcus lanatus* are often used to adulterate the seeds of more expensive grasses, especially the so-called prepared mixtures of seedsmen. In Germany this grass is used on railway embankments, where on the poor, thin soil its strong, creeping roots form a turf which holds the earth together, thus preventing it from being washed or blown away.

Homalocenchrus sp. (See *Leersia*.)

Hordeum decorticatum. (See *Hordeum sativum*.)

Hordeum jubatum Linn. Squirrel-tail-grass; Foxtail; Wild Barley. (Fig. 51.)

A rather slender annual or biennial, usually about a foot high, growing along the sandy seashore, borders of the Great Lakes, and in the alkaline regions of the West. The long and slender awns of the glumes are widely spreading, and the head or spike is thus given the appearance of the "brush" of the fox, hence the common name, "foxtail." This grass is sometimes recommended for cultivation for ornament, and if the tops are cut off before the awns have expanded they may be used for dry bouquets; but the heads soon break up, and for this reason the grass is of little value even for ornament. It has no agricultural value, and, in fact, where it has spread in the West, as it often does along the irrigating ditches, it becomes a serious pest. Hay containing this squirrel-grass is considered nearly valueless. The sharp-pointed joints of the spike, each with several long and slender beards, stick fast in the nose and mouth of horses and cattle, often penetrating the flesh, and cases are reported where they have caused the death of these animals.

Hordeum murinum Linn. Squirrel-grass; Foxtail; Barley-grass (in California).

A coarse, tufted annual, 6 inches to 2 feet high, with dense and somewhat flattened, bearded spikes 2 to 4 inches long. The beards or barbed awns are 1 to 1½ inches long and rather rigid. This grass is a native of Europe, and has been introduced along the Pacific Coast, particularly in California, where it has become a serious pest. At maturity, the head or spike readily breaks up, and the groups of spikelets, which are sharp pointed at the base, adhere to almost any passing object; they work up the nostrils of cattle and into the fleece of

sheep, and may do injury to the animals in much the same way as the native *Hordeum jubatum*.

Hordeum pratense Huds. Wild Barley; Squirrel-tail-grass.

A slender grass, 1 to 2 feet high, with short, flat leaves and a narrow terminal spike 1 to 3 inches long, of short-bearded spikelets. This grass is widely scattered throughout the Central and Western States, growing in thin soils. It is apparently an annual, and is of little or no agricultural value.

Hordeum pusillum Nutt. Barley-grass.

This grass is similar to *Hordeum pratense*, but is usually not so tall, and the outer glumes are lanceolate instead of being bristleform, as in that species. It is of no agricultural value.

FIG. 50.—Velvet-grass. (*Holcus lanatus.*)

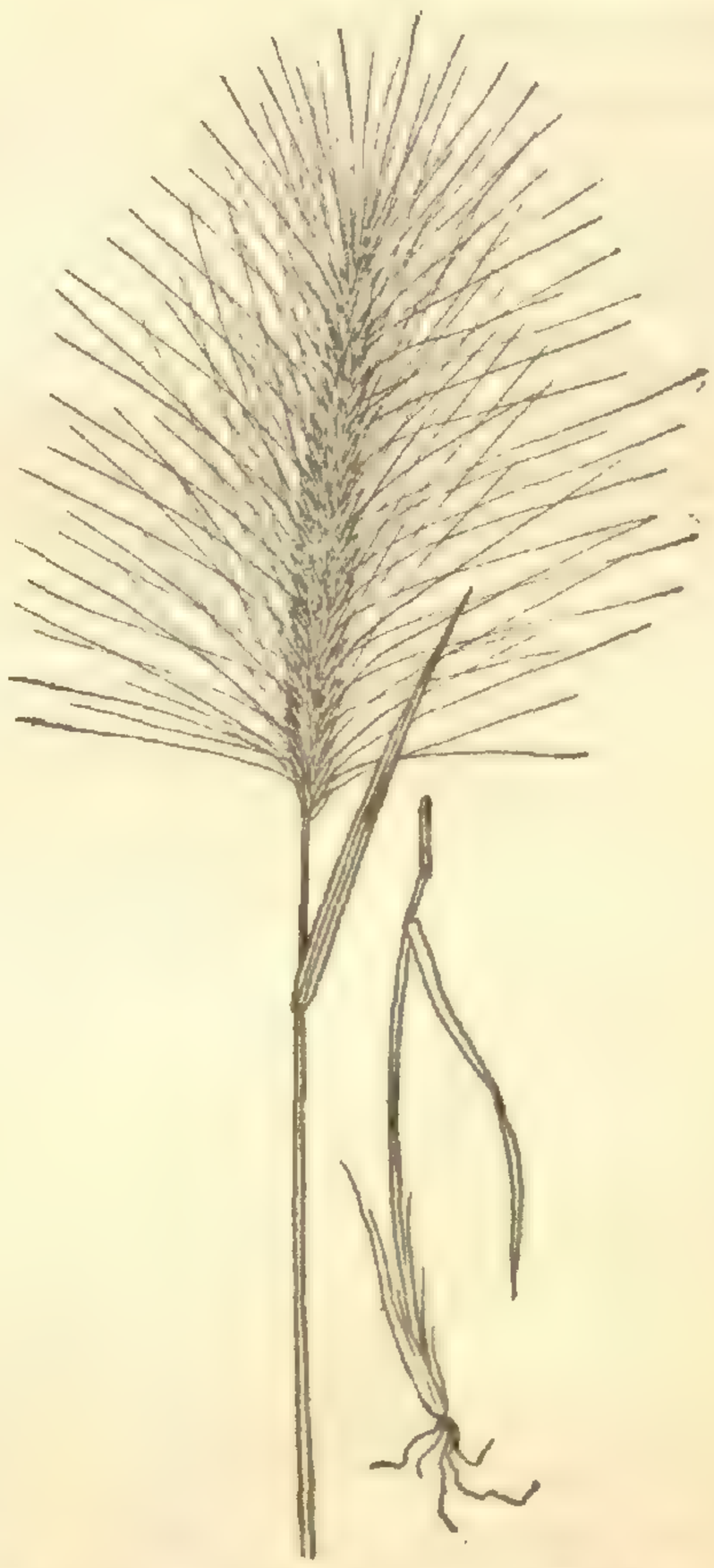

FIG. 51.—Squirrel-tail-grass. (*Hordeum jubatum.*)

Hordeum sativum Jessen. Barley.

Cultivated barley presents many varieties, primarily divided into two-rowed, four-rowed, and six-rowed races. The varieties under these races are based upon the varied characters presented by the head, beards or grain. All appear to have originated from *Hordeum spontaneum* Koch, which grows wild in the countries of southwestern Asia. Six-rowed barley has been in cultivation since prehistoric times in southern Europe; two-rowed barley is now largely cultivated in England and central Europe. The four-rowed barleys are of later origin than the others, and are most generally cultivated in northern Europe and in this country. The barley crop of the United States for 1895 was 87,072,744 bushels, of which amount six States produced over 73,000,000 bushels, California leading with 19,023,678 bushels. Barley is the most important cereal of the far north, some of the varieties being cultivated in Norway to latitude 70°. It is employed in

making bread also in northern Asia and Japan. Barley soup is an article of diet in central Europe. From naked barley (*Hordeum decorticatum*) a mucilaginous tea is prepared, used in medicine. The grain is largely fed to horses, both in this country and in Europe, but the chief use is for brewing beer. "Brewers' grain," a by-product, both wet and dry, is fed to cattle, chiefly in the vicinity of breweries.

Hydrochloa carolinensis Beauv. Floating-grass.

A slender aquatic grass of the Gulf States, growing along muddy banks and in shallow streams. The stems are often 2 feet or more in length, and in shallow water their summits appear above the surface, while in water of greater depth the uppermost leaves are floating. The tender stems and leaves are eaten by stock, and may afford some food for waterfowl.

Hygrorhiza aristata Nees.

An East Indian aquatic grass, either floating on the surface of the water or creeping on wet ground. It has short and broad leaves and umbel-like panicles. Cattle are fond of this grass, and the poorer natives collect the grain by sweeping over the plants with baskets and use it for food.

Imperata arundinacea Cyrill. Blady-grass.

A sand and soil binder common throughout the warmer temperate and tropical regions of both hemispheres. It is a stout, erect, leafy grass, 1 to 3 feet high, with silvery-white spike like panicles. The rootstocks form a perfect network of strong fibers, and in warm countries the grass is recommended for binding river banks, the sides of dams, and the loose sands of the coast This grass is easily propagated by root cuttings, and might be utilized along the Gulf Coast, or along the Lower Mississippi in strengthening the levees. In the Malay Archipelago this *Imperata* is the principal grass of the Alang Alang fields, and is used by the natives for thatching roofs. Cattle eat it with apparent relish when young, and in Bengal it forms a very large portion of the pasturage. The Telingas make use of it in their marriage ceremonies. In western Texas and Arizona there is a native species of *Imperata* very much like the one above described in appearance and habit of growth. It grows naturally around the borders of alkaline springs.

Isachne australis R. Br. Swamp Millet.

A slender grass, creeping at the base, the upright stems 1 to 2 feet high, with loose, open panicles of very small spikelets. It is a native of southern Asia and Australia, generally found growing along the sides of streams and on swampy ground. It is said to be liked by cattle, and Mr. Fred Turner recommends it for planting on the banks of rivers or dams to protect them from injury by heavy rains or floods. The underground stems and roots quickly form a perfect mat in the soil, and when once established they make a very firm turf. The grass may be propagated by seeds or pieces of the root.

Ischæmum angustifolium Hack. Bhabur-grass.

An East Indian grass, 1 to 2 feet high, with rather hard stems and narrow, rigid leaves. It yields excellent material for cordage and is used in the manufacture of paper.

Ischæmum rugosum Gærtn.

A grass of India, common on wet ground on the plains. When young it is eaten by horses and cattle, and in some parts of the central provinces the grain is used for food. (Duthie.)

Kœleria cristata Pers. Wild June-grass; June-grass; Prairie-grass; Western June-grass.

This is a common grass upon the open meadows and plains of the Central and Western States, and extends beyond the Rocky Mountains to the Pacific Coast.

It is one of the "bunch-grasses" of the plains region, where it is generally associated with the more common Bunch-grass, *Poa tenuifolia*. On the dry bench-lands it is seldom over a foot high, but in irrigated ground grows to the height of 2 feet or more, and makes excellent hay. Its cultivation, however, is not to be recommended where better grasses may be had.

Lagurus ovatus Linn. Hare's Tail.

An erect, tufted annual, from a few inches to a foot high, with soft, hairy leaves, and dense, feathery, ovoid heads, 1½ inches long. It is a native of Europe, growing in sandy pastures and waste places. Cultivated occasionally as an ornamental grass, the heads being used in dry bou-

quets. Of no agricultural value.

Lamarckia aurea Moench. Golden-top; Lamarckia.

A low annual, 3 to 12 inches high, with flat leaves and elegant one-sided panicles 2 to 3 inches long. This very attractive and favorite ornamental grass is a native of southern Europe and southwestern Asia. It is frequently cultivated in gardens, and is a pleasing grass for edgings. It has escaped from cultivation in southern California, and has become apparently spontaneous there.

Leersia lenticularis Michx. Catchfly-grass; Flycatch-grass.

A rare, rather coarse, branching perennial, 2 to 4 feet high, found in wet places in the Central and South Atlantic States. It is of little, if any, agricultural value.

Leersia oryzoides Swz. Rice Cut-grass; Rice-grass; Cut-grass; False Rice; White-grass; European Cut-grass; Prickle-grass.

A rough and usually much-branched native perennial, 3 to 4 feet high, with flat leaves, whose margins are armed with minute sharp spines, and one who may carelessly draw his hand along the leaf-blade is very likely to have it severely cut, hence the common name "cut-grass" applied to this species. This grass is widely distributed throughout the temperate regions of the northern hemisphere, growing along sluggish streams and the borders of moist thickets. It possesses no recognized agricultural value.

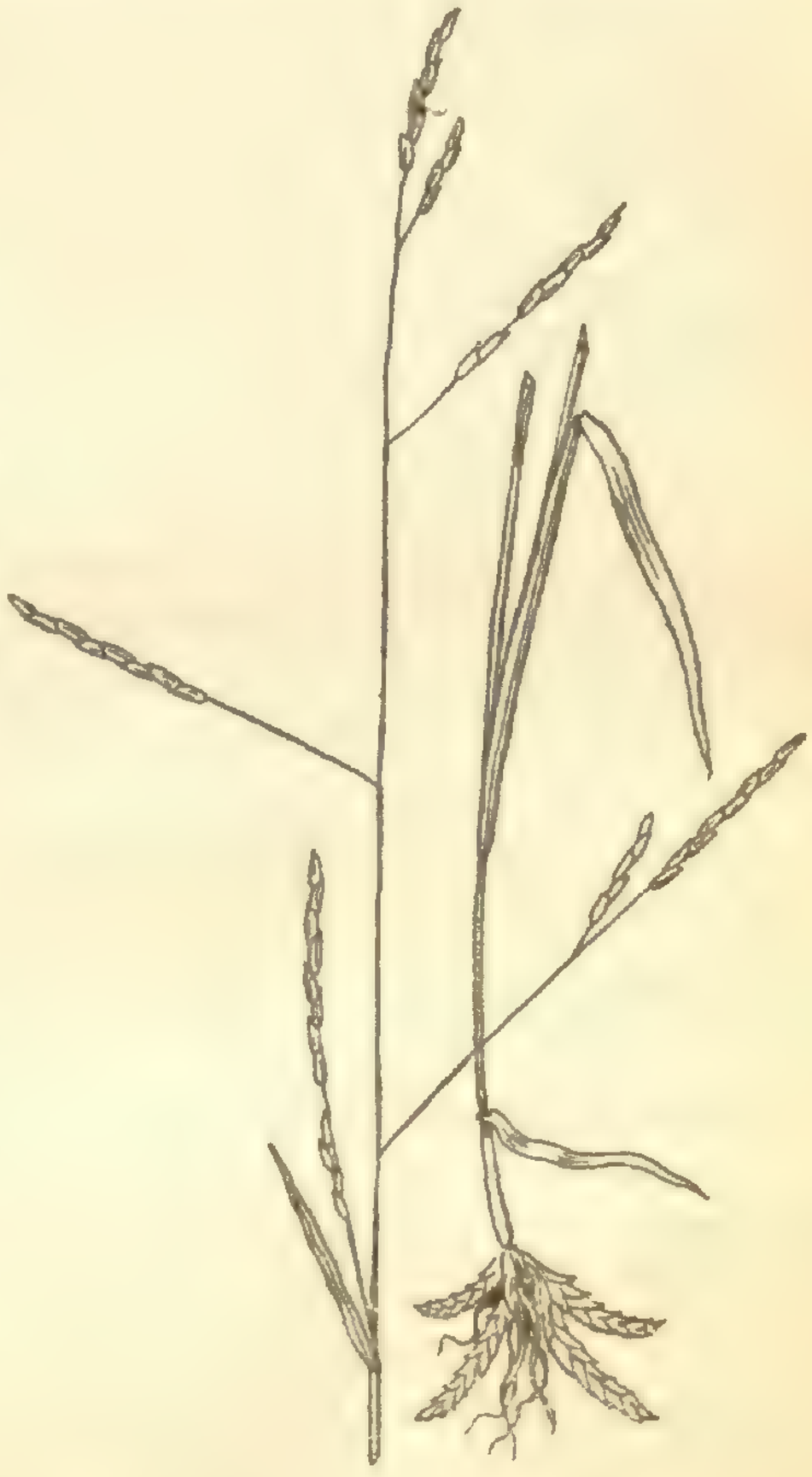

FIG. 52.—Virginia Cut-grass. (*Leersia virginica*.)

Leersia virginica Willd. Virginia Cut-grass; White-grass; Small-flowered White-grass. (Fig. 52.)

A slender and usually much-branched leafy grass, 2 to 4 feet long. It is found in similar situations with the last, ranging from Maine to Minnesota, and southward to the Gulf. This grass is less harsh and rough than the other species of the genus here mentioned, and in low, wet meadows it sometimes forms a considerable element in the natural hay which such places produce, but like the other species of the genus it is not recognized as possessing any marked agricultural value.

Leptochloa mucronata Kunth. Feather-grass.

An annual weed common in rich cultivated grounds and gardens in the Southern States, extending northward to Illinois and Missouri. It grows to the height

of 2 to 4 feet, has rather broad leaves and long terminal, somewhat plume- or feather-like panicles.

Lepturus paniculatus. (See *Schedonnardus texanus.*)

Lolium italicum A. Br. Italian Rye-grass.

A well-known and excellent grass for rich and rather moist lands, particularly for the Eastern States. It is a very rapid grower, forms a dense turf, and in Europe, whence the grass was introduced into this country, it is regarded as one of the best hay grasses. On stiff, heavy clays or on very dry soil it does not do well; but on good, calcareous loams or marls or on moist, loamy sands, where the soil is in good condition, it is very productive and no other grass repays manuring so well. It is not recommended for permanent pastures, as its duration is only two or three years, but it is a most excellent species for temporary meadows. Few grasses develop more rapidly than this, and where the soil is rich and its fertility maintained by applications of liquid manure, cuttings may be obtained within three or four weeks from seeding, and at intervals of a month or six weeks successive crops may be harvested. Owing to its succulent character and rapid growth, this makes one of the best grasses for soiling. Italian Rye-grass is at once distinguished from any of the forms of perennial Rye-grass by its awned or bearded spikelets. Adulterations of the seed of Italian Rye-grass are rare, owing to its relative cheapness. The average purity of commercial seed i, 95 per cent, while the germinative power is 70 per cent. The germinative power diminishes rapidly with the age of the seed. One pound of seed contains on an average 285,000 grains, and the weight per bushel varies, according to the quality, from 16 to 24 pounds. Three bushels of seed of average quality are required for seeding an acre of land. Current price in the New York market is $10 per 100 pounds.

Lolium perenne Linn. Perennial Rye-grass; Ray- or Rye-grass; Darnel; English Rye-grass. (Fig. 53.)

Perennial Rye-grass has been cultivated in England for more than 200 years, and is therefore one of the oldest if not the very first grass gathered and cultivated separately for agricultural purposes. It is indigenous to Europe, North Africa, and western Asia, and was many years ago introduced into this country from England. Here it has never been so highly esteemed as in England, where the soil and climate appear to be especially well adapted to its growth. Moist and rich loams or clays are the soils best suited to it, and, as with Italian Rye-grass, it responds promptly to the application of quick manures. For pastures on heavy soils in moist climates it is especially valuable, and under such conditions is largely used in mixtures for permanent pastures. It is a good hay grass where the conditions are favorable, but in this country will never be so highly esteemed as Timothy. There are several varieties of perennial Rye-grass recognized by agriculturists. Pacey's Perennial, a vigorous form, is one of these. The average purity of perennial Rye-grass seed is given at 95 per cent, and the germinative power at 75 per cent. Good commercial seed should grade higher than this. One pound of pure seed contains on an average 336,800 grains. Of course, where the seeds are larger and heavier, this number would be considerably less. The best seed weighs from 25 to 35 pounds per bushel, and 2 to 3 bushels of seed are required per acre. The current retail price of good seed is $9 per 100 pounds.

Lolium temulentum Linn. Darnel; Poison Rye-grass; Bearded Darnel. (Fig. 54.)

An annual grass, 2 to 3 feet high, having a general resemblance to Italian Rye-grass, but usually stouter, more strictly erect, with longer glumes and larger seeds. It has been introduced into this country with the seeds of other grasses, and is occasionally met with in grain fields and about dwellings. The grain contains a narcotic or poisonous principle, which causes eruptions, trembling, and vertigo

in man and flesh-eating animals. If the seeds are malted with barley, the ale causes intoxication very suddenly. It is contended by some that perfectly healthy Darnel seeds are innocuous—that only grains which are ergotized or otherwise diseased are injurious.

Lygeum spartum Linn. Sennoc; Albardine; Esparto-grass (in part).

A rigid, upright grass, with creeping rhizomes and stiff, rush-like leaves. It is common on the high, rocky plains of southern Spain and Algeria, and, with *Stipa tenacissima*, furnishes the esparto of commerce, used in paper making, etc.

Manisuris granularis Swz. Lizard-tail-grass.

A much-branched annual grass, 1 to 4 feet high, with flat leaves and numerous slender spikes in irregular, leafy panicles. A weed in all tropical countries, extending into the warmer parts of the Southwestern States.

FIG. 53.—Perennial Rye-grass. (*Lolium perenne.*)

FIG. 54.—Darnel. (*Lolium temulentum.*)

Melinis glutinosa. (See *Melinis minutiflora.*)

Melinis minutiflora Beauv. Molasses-grass, or Fat-grass.

A sweet and highly nutritious species, and the most esteemed of the grasses of central Brazil, where it is native, growing upon the hills and dry lands. It is regarded a most excellent grass for dairy cows, and deserves a trial in the Southern and Southwestern States and California. The Brazilian names for this grass are "*Capim mellado*" and "*Capim gordura.*" The English names given above are translations of these. This species occurs also in Ascension, Natal, and Madagascar.

Milium effusum Linn. Wild Millet; Millet-grass; White-topped Millet-grass.

A pale-green perennial grass, 2 to 5 feet high, with broad, flat leaves and spreading panicles. This is a native of cold, damp woods and mountain meadows of the

northern portions of the United States and ranges around the world in the cooler temperate regions of the North. It is a tender grass, readily eaten by cattle, and doubtless possesses some agricultural value. The seeds are easily gathered and the propagation of the grass in wooded pastures or parks might be advantageous.

Milium multiflorum. (See *Oryzopsis multiflora.*)

Miscanthus fuscus Anders.

A rather handsome grass of the plains of northern India, 4 to 8 feet high. "It is chiefly used for thatching material, and writing pens are said to be made from its stems." (Duthie.)

Miscanthus sinensis Anders.

A handsome, showy grass, 3 to 6 feet high, used for the adornment of lawns, etc. It has long been known to florists under the name of *Eulalia japonica*. The long and very numerous lower leaves are usually marked with transverse or longitudinal white bands. The rather delicate and somewhat fan-shaped panicles, if cut when just expanding, are valued for dry bouquets.

Monanthochloë littoralis Engelm. Salt Cedar.

A creeping grass, with hard, almost woody stems, and crowded subulate leaves less than an inch long. A spray of this grass bears a striking resemblance to a branch of cedar, whence the common name. It grows on the salt marshes and in the sands along the coast from southern Florida to Texas, southern and Lower California. From its habit of growth it may possess some value as a soil and sand binder. It is too hard and rigid to be of any value for forage.

Muhlenbergia capillaris Kth. Seaside Hair-grass; Muhlenberg's Hair-grass.

An upright grass with unbranched stems, about 2 feet high, very long and rather rigid leaves, and diffusely branched capillary panicles. This grass grows in tufts or bunches in dry, sandy soil, open pine woods, etc., throughout the Southern States. It is of no agricultural value, but the delicacy of the panicles, which are often purplish-tinged, make it an attractive object for bouquets.

Muhlenbergia diffusa Schreb. Nimble Will; Wire-grass; Drop-seed-grass. (Fig. 55.)

A low, slender, diffusely branched grass growing on dry hills, in woods, and especially in shady waste grounds about dwellings. The leafy, wiry stems, which are from 6 to 18 inches long, spring from extensively creeping and rather tough rhizomes, which make a turf very difficult to break up. When young, this grass is readily eaten by all kinds of stock, but after it matures it is so tough that few animals will touch it. It possesses really very little agricultural value, and some look upon it rather as a weed. It is native from southern New England to Iowa, Michigan, and southward, blooming in the latter part of summer.

Muhlenbergia distichophylla Kth. Saccatone; Grama.

This is a strong, firmly rooted grass, 3 to 4 feet high, with rather long and rigid leaves, and a narrow panicle often exceeding a foot in length. It is frequent in the rich valleys in Arizona and New Mexico, and on rich bottom lands it is often cut for hay. It is a coarse grass, like *Sporobolus wrightii*, and by the settlers is classed with it under the general name of Saccatone. In Arizona it forms the more common "hay" that one finds in the towns and way stations, being pulled by the Mexicans or Indians and brought in on the backs of donkeys or on carts. There are many species of *Muhlenbergia* in the southwestern part of the United States and northern Mexico, and doubtless many of them are of considerable agricultural value. *Muhlenbergia virescens* is a soft and leafy species growing in clumps on the higher slopes of the mountains in Arizona, and with *Poa fendleriana* forms the chief herbage of the so-called "deer parks" of the mountains. (Pringle.)

Muhlenbergia glomerata Trin. Muhlenberg's-grass; Satin-grass; Wild Timothy. (Fig. 56.)

An upright, usually sparingly branched perennial, 2 to 3 feet high, with densely flowered, narrow panicles 2 to 4 inches long, often resembling those of timothy; the rootstocks are very tough, and closely covered with thickened scales. It frequents bogs and low grounds from New England westward to the Rocky Mountains, extending southward to Tennessee, New Mexico, and Texas. It is little prized in the East, but in the Northwestern States it is recommended as an excellent grass for forage.

Muhlenbergia mexicana Trin. Drop-seed-grass; Wood-grass; Knot-root-grass. (Fig. 57.)

A much-branched, leafy perennial, 2 to 3 feet high, with strong, scaly, creeping rootstocks, which often do good service in binding river embankments, along which this grass frequently grows. In the Northeastern States this grass is common in

FIG. 55.—Nimble Will. (*Muhlenbergia diffusa.*)

FIG. 56.—Wild Timothy. (*Muhlenbergia glomerata.*)

FIG. 57.—Mexican Drop-seed-grass. (*Muhlenbergia mexicana.*)

low meadows, where it occasionally forms a considerable proportion of the native hay of such places. If cut before the stems have become woody, which they do after flowering, the hay produced is of good quality. It ranges from New England southward to the Gulf and westward to the Rocky Mountains. In the Eastern States it blooms in August.

Muhlenbergia pungens Thurb. Black Grama; Grama China.

A rather rigid perennial, 12 to 18 inches high, with firm, sharp-pointed leaves and open panicles. It has strong, creeping roots, and often does good service as a sand binder. In the sand-hills region of Nebraska it grows abundantly around

the borders of the so-called "blow-outs," preventing their extension and assisting materially in restoring the turf. In some parts of Arizona where it occurs it is esteemed a valuable forage plant. It grows from Nebraska southward to New Mexico and Arizona, and along the Colorado River above Fort Yuma.

Muhlenbergia texana Thurb. Grama.

This grass is a native of New Mexico and Arizona, growing on the dry mesas and table-lands. It has a straggling habit of growth. The stems are 1 to 2 feet long, much-branched, and often matted together. It furnishes excellent feed for cattle in the regions where it grows, and yields good hay, which is harvested in considerable abundance by the ranchmen. It withstands drought very well, but it is soon run out under the continued tramping of cattle.

Muhlenbergia trichopodes Chapm. Bunch Hair-grass.

A grass of the Southern States, growing in dry pine woods; similar in habit to *Muhlenbergia capillaris*. Of little value.

Munroa squarrosa Torr. False Buffalo-grass; White Alfillaria.

A low, diffusely spreading, much-branched annual, with numerous and crowded short, rigid leaves. When young the whole plant has a silvery-gray, "fuzzy" appearance, and when older it resembles alfillaria to some extent. It occurs in dry, sandy soil along roadsides and waste places, where little or nothing else grows. It spreads out over the ground, rooting at the joints, and a single plant will frequently cover a circular area of a foot or two in diameter. It is a native of Montana, extending eastward to Nebraska and southward to Texas and Arizona.

Opizia stolonifera Presl. Mexican Lawn-grass.

An extensively creeping, dicecious grass, the very slender, prostrate stems sending up leafy tufts 1 to 4 inches high. Similar in habit to Bermuda, but more delicate. According to Dr. E. Palmer, this is one of the most important grasses of Mexico. Growing close to the ground, it forms a thick sod over all exposed surfaces, even over the cobblestones in the streets of towns. It is used in the public squares with good effect. By regular watering it is kept nicely green, and but little cutting is necessary. The seed is difficult to obtain, owing to the constant nibbling of domestic animals. Propagation by cuttings of the rooting, prostrate stems is probably the best method. Trials with this grass ought to be undertaken in the Southern States, both for lawns and pastures.

Oplismenus setarius R. & S. Creeping Beard-grass.

A slender perennial of the Gulf States, with decumbent or creeping stems, and short and rather broad leaves. It posesses no recognized agricultural value, but as it grows naturally under the dense shade of trees it might be used for covering the ground in shady places where other grasses will not thrive. It can be propagated by pieces of the stem which root at the joints, and if cared for, will in a short time make a good turf. A closely allied grass of similar habit of growth, with variegated leaves, is often grown in greenhouses for its ornamental appearance.

Oryza sativa Linn. Rice.

A tropical or subtropical, semiaquatic grass, the grain of which is the staple food of one-third of the human race. It is most extensively cultivated in southern Asia, China, and Japan, and the annual produce of these countries is estimated at 100,000,000 tons. The rice-growing districts of China support the densest population in the world. In this country rice is cultivated in the States of South Carolina, Georgia, and Louisiana. The estimate of the crop of cleaned rice produced by the latter State in 1895 was 82,436,832 pounds. "Paddy" is the grain

in the husk. There are many varieties of rice, distinguished by color or size of the grain, absence or presence of awns, etc., and then there are two classes known as "lowland rice" and "upland rice." The latter is cultivated to some extent in western Tennessee. Rice straw is used for making paper.

Oryzopsis asperifolia Michx. Mountain Rice; Large White-grained Mountain Rice.

A perennial, 6 to 18 inches high, with very long basal leaves overtopping the stems. This grows in rich, open woods, upon hillsides, from New England to Minnesota and northward. It is one of the early blooming species, flowering in May and ripening its seed in June and July. The leaves remain green throughout the winter.

Oryzopsis canadensis Torr. Small Mountain Rice.

A slender perennial, 6 to 15 inches high, with almost thread-like basal leaves, and a narrow few-flowered panicle. It is a native of the Northern States, from Maine to the mountains of Pennsylvania and westward to Minnesota, growing upon rocky hills and in open woods, blooming in May. It is never sufficiently abundant to form any material part of the natural herbage.

Oryzopsis cuspidata. (See *Oryzopsis membranacea.*)

Oryzopsis melanocarpa Muhl. Black-fruited Mountain Rice.

A rather stout, long and broad-leafed grass, 2 to 3 feet high, with a simple panicle of a few rather large spikelets. Grows in rich, rocky woods from New England southward to Pennsylvania and westward to the Rocky Mountains, blooming in July and August. These species of *Oryzopsis* have no recognized agricultural value, but they are very hardy perennials and might be propagated to advantage in woodland parks.

Oryzopsis membranacea Vasey. Indian Millet; Quivering-grass; Bunch-grass; Wild Millet; Sand-grass. (Fig. 58.)

A grass of rather striking appearance, 1 to 2 feet high, widely distributed throughout the Rocky Mountain region from British America southward to Texas and New Mexico, eastward to the Missouri, and westward to the Sierras of California. It grows in dry, sandy soils, forming bunches of greater or less size, and from this habit of growth it has been called, along with a number of other grasses, "Bunch-grass." It thrives in soil too dry and sandy for the growth of most other grasses, and is much esteemed for grazing in the regions where it abounds. In New Mexico this grass is by some deemed superior to grama, on account of its large and nutritious seeds or grains, which are used by the Indians to some extent for food.

FIG. 58.—Indian Millet. (*Oryzopsis membranacea.*)

Oryzopsis multiflora Beauv. Many-flowered Millet-grass.

A perennial, 2 to 3 or 4 feet high, with a many- and small-flowered nodding panicle, 6 to 12 inches long. It is a native of central and southern Europe, growing in dry, open woods and thickets. Was introduced into California in 1879, and has been cultivated experimentally with varying success at a number of points in that State. On the granitic soil of San Diego, Cal., it has grown 3 feet high without irrigation, and remained green throughout the year. Horses and cattle are said to eat it greedily. In Europe it is not regarded as possessing much, if any, agricultural value.

Panicum agrostoides Muhl. Panic Bent-grass; Munro-grass; Red-top Panic-grass.

A native perennial, with branching, leafy stems 2 to 4 feet high, and a panicle resembling that of Red-top. It grows in low meadows and along the banks of creeks, shores of ponds, etc., and often yields a large amount of very good native hay. In low, moist, and rather rich meadows its cultivation would doubtless be profitable, and it is certainly deserving of a trial in such locations.

FIG. 59.—Munro-grass. (*Panicum agrostoides.*)

FIG. 60.—Bitter Panic-grass. (*Panicum amarum.*)

Panicum amarum Ell. Bitter Panic-grass. (Fig. 60.)

A grass of the sandy seacoasts, ranging from Connecticut southward to Florida and along the Gulf. It has coarse, hard stems, 1 to 5 feet high, and strong, creeping rootstocks, making it an excellent sand binder. The islands off the coast of Mississippi are almost wholly made up of drift sands, the outer sides being dunes from 10 to 30 feet high, while the middle of the islands is usually low and occupied by swamps or lakes. This bitter panic is very abundant upon the outside of these dunes, where it is exposed to the winds and waves, and where it serves to effectually bind the otherwise shifting sands. The leaves and stems have a bitter taste, hence the common name.

Panicum antidotale Retz.

A tall, coarse, glabrous perennial of northern India, with long, narrow leaves and contracted panicles, in general appearance resembling Guinea-grass. Common all over the plains, in hedges and among bushes. Of doubtful value as a fodder plant, being grazed only when quite young. Regarded as injurious to stock when eaten green. The smoke of this grass has a reputed value for fumigating wounds and as a disinfectant in smallpox. In Madras, India, it is used medicinally in throat affections. (Duthie.)

Panicum barbinode. (See *Panicum molle*.)

Panicum capillare Linn. Old Witch-grass; Fool-hay.

An annual, with usually coarse, branching stems, 1 to 3 feet long, hairy leaf sheaths, and widely spreading panicles. Grows in cultivated grounds, where it often becomes a somewhat troublesome weed. Being an annual, however, it is easily eradicated. Possesses no value for fodder.

Panicum ciliatissimum Buckl. Indian Wheat.

A more or less extensively creeping perennial, with short leaves and upright flowering stems, 6 to 18 inches high. The panicles are narrow and few-flowered, and in the prostrate forms usually partly included within the leaf sheaths. This grass is a native of western Texas and doubtless possesses some agricultural value for the drier regions of the Southwest. The creeping stems resemble somewhat those of Bermuda-grass, but the leaves are usually more crowded and broader in proportion to their length.

Panicum colonum Linn. Shama Millet; Wild or Jungle Rice.

A native of the tropical and warmer temperate regions of the Old World. In northern India it is considered one of the best fodder grasses. Introduced into the Southern and Southwestern States, where it is occasionally found in waste grounds about dwellings. It is closely related to *Panicum crus-galli*, differing from that grass in its smaller size and more simple inflorescence. The stems and leaves are tender and readily eaten by stock, and in India the grain, which is produced abundantly, is sold in the markets and used for food.

Panicum crus-galli Linn. Barn-grass; Barnyard-grass; Barnyard-millet; Cock's-foot; Water-grass; Large Crowfoot-grass; An-kee (American Indian). (Fig. 61.)

This well-known annual of rank growth is common in rich, cultivated ground, especially around dwellings. There are several forms presented by this species. That growing as a weed around barnyards and dwellings, in cultivated grounds in the Atlantic States, was probably introduced from Europe. There are, however, several native varieties, or possibly good species. One of these occurring in the brackish marshes or meadows along the seacoast, grows to the height of 3 to 5 feet, with the lower leaf sheaths very hirsute, and the spikelets long-awned. A tall, smooth form occurs in New Mexico, Arizona, and the Mohave desert region, springing up after the summer rains in all swampy places or lowlands. It grows to the height of 6 or 7 feet, and its seeds, which it produces abundantly, are collected by the Mohave Indians, ground into flour, and cooked for food. The poorer classes of India also use the grain for food. A variety introduced from Japan has been cultivated at some of the experiment stations and treated as a millet. At the Hatch Experiment Station, in Massachusetts, the crop produced was very uniform, averaging 7 feet in height. The yield was at the rate of 11,207 pounds of straw per acre and 66.7 bushels of seed. When sown for silage or for soiling at the rate of one peck of seed to the acre, the yield was at the rate of from 15 to 18 tons per acre. A field sown July 26, after a crop of hay was removed, yielded 12 tons per acre. It is very much liked by stock, and is a valuable forage plant for feeding green or for the silo. It is not so well adapted for hay, as it is a coarse, succulent grass, and rather difficult to dry.

Panicum curtisii Chapm. Maiden Cane; Simpson's-grass.

A rather coarse grass, 2 to 4 feet high, growing along ditches, in swamps, and in moist sands from Delaware southward to Florida and along the Gulf near the coast. It has strong and widely spreading or creeping rootstocks, which are useful in binding sandy railroad embankments in the Southern and Gulf States.

Panicum decompositum R. Br.

A stout, semiaquatic, Australian grass, with long, flat leaves, and diffusely branching panicle 6 to 12 inches long. The grain is used for food by the aborigines of Australia. Baron Ferd. von Mueller says of this and the Australian *Panicum effusum* that "they are among the few nutritious grasses fit for hot and arid desert tracts." The habit of *P. decompositum* closely resembles that of *Panicum proliferum* (which see).

Panicum divaricatum Linn. Branching Panic; Small Cane.

A smooth, somewhat shrubby grass, with stems 6 to 8 feet high, and numerous short, spreading branches. It is a grass of tropical and subtropical America presenting quite a variety of forms, one of these extending into southern Florida.

FIG. 61.—Barnyard-grass. (*Panicum crus-galli.*)

FIG. 62.—Guinea-grass. (*Panicum jumentorum.*)

Panicum fasciculatum Sw. Concho-grass.

A rather coarse and much-branched leafy annual, growing in clumps to the height of 2 to 3 feet. The leaves are flat, one-fourth to one-half an inch wide, and 2 to 6 inches long. It is a native of Texas and Florida. Similar in character and closely allied botanically to *Panicum texanum*.

Panicum filiforme Linn. Slender Crab-grass.

A native annual grass, common in sandy soils, particularly in old fields, flowering in July and August. It is closely related to Crab-grass, which it much resembles, but is more slender in its growth, and is of very little or no agricultural value.

Panicum flavidum Retz. Kangna (India).

An annual with rigid, erect culms, 1 to 2 feet high. Common throughout the plains region of northern India, and generally considered a good fodder grass. It produces a large quantity of grain, which is collected and eaten by the poorer classes in times of scarcity.

Panicum frumentaceum Roxb. Shamalo or Deccan grass.

An annual, 2 to 4 feet high, with rather broad leaves and narrow, erect panicles. Closely related to and somewhat resembling Barnyard-grass. It is of rapid growth, and is largely cultivated in northern India as a rainy-season crop. The seeds are used for food by the poorer people, while the stalks are used as fodder for cattle.

Panicum helopus Trin. Kuri (India).

A grass of southern Asia, with creeping or ascending branching stems, 1 to 2 feet high. Cultivated grounds, etc., in northern India, where it is regarded an excellent fodder grass for horses and cattle. This grass resembles *P. fasciculatum* in habit.

Panicum hirtellum. (See *Oplismenus setarius.*)

Panicum italicum. (See *Setaria italica.*)

Panicum jumentorum Pers. Guinea-grass; St. Mary's-grass. (Fig. 62.)

This grass was long ago introduced into America, presumably from tropical Africa, and has for many years been cultivated in tropical South America and the West Indies. In these regions it is spoken of as being a splendid pasture grass, growing to the height of 12 feet, forming dense tufts. It is readily propagated by cuttings of the creeping rootstocks. It has been introduced into some of the Gulf States, particularly Florida, where it is highly valued. Few grasses yield a larger amount of fodder, and it may be cut as often as once a month during the growing season. If allowed to attain its full size it becomes coarse and unfit for forage. Its stems are killed by the first frosts of autumn, and it seeds only in the warmest parts of the States bordering the Gulf. It is much less hardy than Johnson-grass, with which it has been confounded by some, and has quite a distinct habit of growth.

Panicum junceum Nees.

Rigid, erect, branching grass, 3 to 5 feet high, with a rather large, more or less densely flowered, nodding panicle. This is a native of South America, and in Argentina the strong rhizomes are used as a substitute for soap in washing woolen goods.

Panicum leucophæum H. B. K. Cotton-grass.

A variable species widely distributed throughout the tropical regions of both hemispheres. It is a perennial with slender or stout stems 1 to 3 feet high, usually with flat leaves and narrow panicles, the spikelets being densely clothed with long silky or cottony hairs, which are white, or sometimes brownish or purplish. When abundant this grass yields excellent pasturage. It has been found in southern Florida and at other points near the Gulf coast. There is a variety of this species growing in the dry regions of Arizona and New Mexico which has more slender stems, that spring from strong woolly and knotted rhizomes. Doubtless this form would be a valuable pasture grass for the dry or semiarid regions where it is native.

Panicum maximum. (See *P. jumentorum.*)

Panicum miliaceum Linn. Common Millet; Millet; Manitoba Millet; Broom-corn Millet; Brown Millet; Japanese Panicle Millet; Dakota Millet; Hog Millet; Russian Millet.

A rather coarse annual, attaining a height of 2 to 4 feet, with large, drooping,

loosely flowered panicles. There are several varieties, distinguished by the color of the fruit or character of the panicle. This is the true millet which has been cultivated in the East from prehistoric times, so that now its native country is not known. It is still cultivated to a considerable extent in China and Japan, also in South Russia and Roumania, and to a limited extent in other parts of Europe and North Africa. It requires a rich soil, and under favorable conditions its growth is very rapid and its production of seed large, in some instances amounting to 60 or 70 bushels to the acre. The grain is nutritious, and is one of the best for feeding poultry. When ground the flour makes a rich and nutritious porridge, for which purpose it is chiefly used in the eastern countries where the grass is grown. In northern India, where the grain is largely used, a preparation of it constitutes a favorite food at marriage ceremonies. Owing to its rapid and somewhat succulent growth, it is an excellent soiling plant. It has, however, been little cultivated in this country, but is occasionally found in the older settlements in cultivated fields and waste grounds about dwellings. The number of grasses termed millets in various parts of the world is large, and includes many very different species, whose grain, however, is used for human food. Most of the so-called millets belong to the genera *Setaria*, *Panicum*, and *Paspalum*. They form the principal food grains of the natives of many parts of Africa and Asia. It has been estimated that the millets feed one-third of the human race.

Panicum miliare Lam.

An annual, with branching stems, 2 to 3 feet high, and drooping, loosely flowered panicle. A native of India, where it is cultivated to some extent by the poorer classes for its grain.

Panicum molle Sw. Para-grass; Yerba de Para; Spanish-grass.

A rather coarse, reed-like perennial, 4 to 6 feet high, with hairy nodes, and narrow, lax panicles, 6 to 8 inches long. It is cultivated in South America and in the West Indies and Mexico, and has been introduced into some of the Gulf States. It is grown with success on the high pine ridges of Florida, and wherever cultivated it is most highly esteemed and regarded as a very fattening pasture grass. How far to the north this grass may be grown successfully does not appear to have been determined, but it is hardy at the Cape of Good Hope and other far extra tropical regions (Baron von Mueller). It is propagated either by seeds or root cuttings.

Panicum obtusum H. B. K. Vine Mesquit; Grapevine Mesquit; Grapevine-grass; Range-grass (Arizona).

A stoloniferous grass, the runners attaining a length of 8 to 10 feet, the upright flowering culms 12 to 24 inches high. This grass ranges from Colorado to Texas, New Mexico, Arizona, and southward into Mexico. It is usually found in irrigated lands or in the low, damp soil of the valleys, most frequently under the shade of trees and shrubs. No attempts have been made to cultivate this grass, but its appearance and habit of growth indicate an agricultural value of sufficient importance to call for experiments in its cultivation. In New Mexico this species is called "Wire-grass."

Panicum plicatum Lam.

A broad-leafed perennial, 3 to 4 feet high or more, native of India. The leaves are elegantly striate and usually plicate, giving to the grass an unusual and at the same time attractive appearance. It is a favorite ornamental for greenhouse culture.

Panicum proliferum Lam. Sprouting Crab-grass; Sprouting Millet.

A smooth and usually much-branched native annual, with rather coarse, spreading or ascending stems 2 to 6 feet long, flat leaves, and diffuse terminal and lateral panicles. It grows naturally in moist, rich soil along the banks of streams and rivers, around the shores of ponds and lakes, and in the South is often abundant in rich, cultivated fields, growing with Crab-grass. The stout, succulent stems are sweetish and much liked by horses and cattle. Its range is from Maine to Iowa, and southward to the Gulf, blossoming in the latter part of summer or early autumn. A spontaneous growth of this grass in cultivated fields after the removal of crops is of some value for hay or pasturage, but its cultivation can not be recommended in view of the fact that we have many annual grasses much superior to it. In the Northern and Middle States it is classed with the weeds.

Panicum prostratum Lam.

A low, creeping grass of the tropical regions of both hemispheres. It is common on the plains of northern India, where it is regarded as a good fodder plant, and in times of famine the grain is used for food.

Panicum repens Berg. Creeping Panic.

An extensively creeping grass, with rather stiff upright stems, 1 to 2 feet high or less. It is common in the maritime districts in southern Asia, northern Africa, southern Europe, and Australia. It is also found along the shores of the Southern States bordering the Gulf, extending westward to Mexico. It has no agricultural value, but is a natural sand binder, and upon the sandy islands lying off the Gulf Coast it grows abundantly upon the outside of dunes, protecting them from the action of the winds and waves.

FIG. 63.—Crab-grass. (*Panicum sanguinale.*)

Panicum roseum. (See *Tricholæna rosea.*)

Panicum sanguinale Linn. Crab-grass; Finger-grass; Hairy Finger-grass; Manna-grass; Polish Millet; Red Millet. (Fig. 63.)

A well-known annual, common in nearly all parts of the United States, growing in cultivated fields and about dwellings. It is a weed in gardens and among hoed crops. In grain fields after harvest it frequently springs up in such quantity, particularly in the Southern States, as to yield one or even two good cuttings of hay. This spontaneous growth affords excellent pasturage, as well as hay of first quality if properly cured. The stems are much branched, and in good soil attain a length of 3 to 4 feet. This grass contains little fiber, and dries quickly when cut, but if after cutting it is wet by rains or heavy dews its value for hay is almost wholly destroyed. In Bohemia, Crab-grass is cultivated upon sandy soils and the grain is used for food in the form of mush or porridge.

Panicum serotinum Trin. Little Crab-grass; Creeping Crab-grass. (Fig. 64.)

A species related to Crab-grass (*Panicum sanguinale*), common in the Southern States near the Gulf, disputing with Louisiana-grass the claim of being the most valuable native pasture grass of that section. It is probably a biennial. It is much like Crab-grass, sending out leafy, creeping shoots at every joint, but is smaller in every way, with shorter and more hairy leaves of a lighter green color. It is invaluable for pasturage, forming a close turf, and driving out nearly all other plants. It grows best in sandy soil where there is a little moisture.

Panicum spectabile Nees. Angola-grass.

A stout grass, 3 to 5 feet high, with rather broad and long (1 to 2 feet) leaves, and a terminal densely flowered, compound, and narrow spike 8 to 10 inches long. Imported into South America many years ago from the west coast of Africa (the region of Angola). It is cultivated on the low lands in the eastern part of Brazil, particularly in the region of Rio de Janeiro, where it is called "Capim d'Angola." This Panicum is closely related to and resembles some forms of Barnyard-grass (*P. crus-galli*). It is spoken of as an extremely productive and nutritious fodder grass, and may prove valuable for the low regions along the Gulf Coast.

Panicum sulcatum Aubl.

A South American perennial, 4 to 6 feet high, with palm-like leaves 1 to 2 inches broad and 16 to 20 inches long, and long, terminal, narrow panicles which taper

FIG. 64.—Creeping Crab-grass. (*Panicum serotinum.*)

FIG. 65.—Texas Millet. (*Panicum texanum.*)

above and below. The leaves of this grass are deeply sulcate or plicate, like those of the Indian *P. plicatum*. Sometimes cultivated for ornament in greenhouses or upon lawns.

Panicum texanum Buckl. Texas Millet; Bottom-grass; Colorado-grass; River grass; Goose-grass; Buffalo-grass; Austin-grass; Concho-grass. (Fig. 65.)

A branching, leafy annual, 2 to 4 feet high, with a narrow panicle 6 to 8 inches long terminating the main stem and branches. It is nutritious, of rapid growth, and upon good soil yields a large amount of excellent hay, and may be cut twice or even three times during the season. It reseeds itself readily. It prefers rich, alluvial soil along river bottoms, etc., and upon such land withstands drought well. In certain parts of Texas, particularly in the counties along the Colorado River, in the central part of the State, where it appears to be native and where

it often comes up in cultivated fields after the removal of corn or other grain crops, it is spoken of in the highest terms as a hay-producing grass.

Panicum turgidum Forsk.

A coarse, hard grass, 1 to 2 feet high, with short leaves and small panicles. A native of the East. In Egypt a kind of bread is made from the grain.

Panicum virgatum Linn. Switch-grass; Wild Red-top; Black Bent. (Fig. 66.)

A tall, native perennial, 3 to 5 feet high, with strong, creeping rootstocks, long, flat leaves, and ample, spreading panicles. When young this affords good grazing, but at maturity the stems become hard and practically worthless for fodder. It ranges from Maine southward to the Gulf and westward to the Rocky Mountains. It is particularly common near the coast in the sandy soils bordering the marshes, and plays an important part there, oftentimes, in preventing the drifting of sands by the winds or the washing of soils by overflows and high tides. On good lands it is very productive, and if cut before the stems have become hard yields a large amount of hay of very good quality.

Pappophorum laguroideum Schrad.

A handsome ornamental, 3 to 5 feet high, with narrow, plume-like panicles a foot or more long. It is a native of Mexico, and has been successfully grown from the seed on the grounds of the Department of Agriculture. It is worthy of introduction as an ornamental for gardens and lawns because of the beauty of its pale straw-colored panicles.

Pappophorum wrightii S. Wats. Purple-grass.

A slender and apparently annual grass of western Texas, New Mexico, and Arizona, growing on the open plains and among the foothills of the mountains. It has short, narrow leaves and narrow, densely-flowered heads or panicles, which are softly bearded and grayish or purplish. It is said to be fully equal to Grama or Buffalo-grass in nutritive value, and more palatable to horses or mules.

FIG. 66.—Switch-grass. (*Panicum virgatum.*)

Paspalum boscianum Flügge. Purple Paspalum.

A rather stout perennial with ascending branching stems, 2 to 3 feet high, long, flat leaves, and numerous racemes crowded near the summit of the culm and its branches. It is a native of the Southern States, growing in moist grounds, preferring rather heavy soils. Like other species of Paspalum, it grows in tufts and often occurs covering considerable areas to the exclusion of other grasses. It yields a good bulk of sweet hay, but is rather slow in drying.

Paspalum dilatatum Poir. Hairy-flowered Paspalum; Large Water-grass.

A rather coarse, leafy perennial, growing in clumps 2 to 5 feet high, bearing near the summit of the stems two to ten more or less spreading racemes or spikes of crowded, hairy spikelets. It is a native of Brazil and possibly was originally introduced into the Southern States (where it has become quite widely distributed) from that country, although it may be a native here. It ranges northward from the Gulf to southern Virginia and Tennessee, and westward to Texas,

growing most abundantly on low, black soils, which are well supplied with moisture. It is considered an excellent pasture grass, and when well established endures seasons of excessive drought without injury. It is particularly valuable as furnishing excellent late summer and autumn feed, during which period it makes its principal growth.

Paspalum distichum Linn. Knot-grass; Joint-grass; Silt-grass; Seaside Millet; Water Couch (in Australia). (Fig. 67.)

A low, creeping species, resembling Bermuda-grass. It is common in the Southern States along the seacoast and in the interior, extending southward from Virginia to the Gulf, and westward to Texas, Arizona, southern California, and northward to Oregon. It occurs throughout the tropical regions of both the

FIG. 67.—Knot-grass. (*Paspalum distichum.*)

FIG. 68.—Smooth Paspalum. (*Paspalum lævе.*)

Old and New World. It grows in more or less sandy soils around the margins of ponds and along river banks, and in such places it often does good service in binding soils subject to wash, and the grass can well be recommended for this use. Its stems are somewhat succulent, extensively creeping, rooting at the nodes. The leaves are tender, affording excellent grazing. The upright stems are a few inches to a foot high, and bear at their summits two slender spikes. This character at once serves to distinguish it from Bermuda, which has several spikes at the apex of the flowering culms.

Paspalum exile Kipp. Fundi or Fundungi.

A slender annual, about 2 feet high, with usually three terminal racemes 3 to 4 inches long. Cultivated in Sierra Leone, where it is native, for its grain, which is used for food.

Paspalum læve Michx. Smooth Paspalum. (Fig. 68.)

A tufted native perennial, with ascending or erect stems, 1 to 3 feet long, flat leaves, and two to five more or less spreading spikes, 2 to 4 inches long. Common in the Middle and Southern States, growing in open fields, meadows, etc., usually where the ground is somewhat moist. It is a late summer grass, blossoming from July to October. Well liked by all kinds of stock. In cultivated grounds, and particularly on lawns, which it occasionally invades, it must be classed as a weed.

Paspalum notatum Flügge.

A perennial species, resembling *Paspalum distichum*, or Knot-grass, but of stouter growth, native of South America, and extending northward into Mexico. It forms a dense carpet-like sward on meadows, and in somewhat saline soil it becomes particularly luxuriant. This grass is employed in certain parts of tropical America as a remedy for venereal diseases.

Paspalum ovatum. (See *Paspalum dilatatum.*)

Paspalum platycaule Poir. Carpet-grass; Louisiana-grass. (Fig. 69.)

A slender, erect, or more frequently prostrate and extensively creeping perennial, rooting at the nodes, and sending up numerous leafy flower-bearing branches, 6 to 24 inches high. The very slender racemes or spikes borne at or near the summit of the stems are 1 to 3 inches long. The prostrate creeping stems spread rapidly, and soon form a dense, carpet-like growth, crowding out all other vegetation. It withstands protracted drought, grows well on almost any soil, and in the more southern districts is evergreen, yielding good pasturage both summer and winter. It is regarded as one of the most valuable native pasture grasses of the regions bordering the Gulf, and is a most excellent lawn grass, superior to Bermuda and less difficult to eradicate. It is found in the warmer regions of both North and South America. It is readily propagated by sets and seeds.

FIG. 69.—Carpet-grass. (*Paspalum platycaule.*)

Paspalum plicatulum Michx. Bull-grass; Purple Paspalum.

Tufted, 2 to 3 feet high, growing in dry, sandy, open ground in the pine barrens of the Gulf States. The racemes or spikes, which are borne near the summit of the stems, are 1 to 2 inches long. Said to furnish fairly good grazing when young, but the stems soon become harsh, wiry, and unpalatable. It is of comparatively little agricultural value.

Paspalum purpurascens. (See *Paspalum boscianum.*)

Paspalum repens Berg. Creeping Paspalum.

A South American perennial aquatic, with long, creeping rootstocks, and many upright, floating stems. "The sheaths are inflated and seem to act as floats. Cattle are so fond of this grass that they will wade far into the water to get a bite of it." (Morong.)

Paspalum scrobiculatum Linn. Koda (India); Ditch Millet.

A smooth annual, with branching erect or ascending stems, 2 feet high or more. Widely distributed throughout the tropical and subtropical regions of both

hemispheres. In habit resembling our native *P. boscianum*. In northern India this grass is cultivated throughout the plains region as a "rainy-season crop." It is usually sown on the poorer kinds of soil, the grain being chiefly consumed by the lower classes. The straw is used for fodder. (Duthie.) A variety of *P. scrobiculatum*, called "hureek" in India, which is perhaps the Ghohana-grass, an Indian species reputed poisonous, is said to render the milk of cows that graze upon it narcotic and drastic. (Lindley.)

Paspalum undulatum. (See *Paspalum plicatulum*.)

Paspalum virgatum Linn.

A stout, coarse perennial, 3 to 6 feet high, with long leaves and an inflorescence of many slender spikes. A native of Mexico and South America. In Paraguay it is largely used for thatching, for which purpose it is very durable. (Morong.)

Penicillaria spicata. (See *Pennisetum spicatum*.)

Pennisetum cenchroides Rich. Anjan-grass; Dhaman.

A native of southwestern Asia and Africa, in which countries it is regarded as one of the best grasses for green fodder and hay. It is so nutritious that the natives have a saying, "What clarified butter (ghi) is to man the Dhaman is to a horse." This grass grows to the height of a foot or more, and has a dense head or spike 1 to 2 inches long.

Pennisetum japonicum Trin.

Erect, with flattened, simple stems 1 to 2 feet high, very narrow leaves, and comparatively loosely flowered purplish or yellowish nodding panicles. A native of Japan. Occasionally cultivated as a curiosity or for ornament.

Pennisetum latifolium Spreng.

A rather broad-leafed, ornamental perennial, 3 to 5 feet high, branching above, with greenish, rather dense panicles 1½ to 2 inches long. Native of Uruguay and Argentina. In the latter country it is used for covering roofs of houses. Occasionally found cultivated here as an ornamental grass. It forms large tufts and is easily propagated by the roots or seeds. It may possess some value as a forage plant.

Pennisetum longistylum. (See *Pennisetum villosum*.)

Pennisetum macrourum Trin.

A South American species, with unbranched stems, 3 to 4 feet high, and densely flowered, cylindrical, yellowish panicles 6 to 8 inches long. Cultivated occasionally for its odd and ornamental appearance.

Pennisetum spicatum. Pearl Millet; Japan Millet; Cat-tail Millet; East India Millet; Horse Millet; Egyptian Millet; Indian Millet; African Millet; African Cane; Bajree Millet; Bulrush Millet.

An annual of luxuriant growth, 6 to 10 feet high, with long, broad leaves, stout culms, and terminal, erect, cylindrical, dense spikes 6 to 12 inches long, closely resembling those of the common cat-tail of the marshes. It is a native of the East, where it has been cultivated for its grain for many years. It is an important agricultural grass of Central Africa. It requires a rich, loose soil to obtain the best growth, and under favorable conditions produces an enormous quantity of green fodder, for which purpose it can be cut several times during the season. It does not dry out readily and is often difficult to cure into hay. It has been cultivated with success as far north as Pennsylvania and in many parts of the South for a good many years. It is best sown in drills about 2 feet apart, and 5 to 6 pounds of seed are required per acre. The weight of good seed per bushel is 56 pounds. The current price is $12 to $14 per 100 pounds.

Pennisetum typhoideum. (See *Pennisetum spicatum.*,

Pennisetum villosum Brown.

An Abyssinian species which has been introduced into cultivation because of its ornamental appearance. It grows to the height of 1 or 2 feet, has long, narrow leaves, and dense, oblong or cylindrical, finely bearded heads 2 to 4 inches long. It is a hardy perennial, graceful and attractive in appearance, and is very frequently cultivated as an ornamental under the name of *Pennisetum longistylum.*

Phalaris angusta. (See *Phalaris caroliniana.*)

Phalaris arundinacea Linn. Reed Canary-grass; Ribbon-grass.

A tall, leafy perennial, 2 to 4 feet high, from a creeping rootstock, with smooth sheaths and narrow, branching panicles 4 to 8 inches long. It is a native, common on low, wet grounds from New England southward to Tennessee, and extending across the continent to California and Washington. It is native also in Europe and northern Asia. It is little affected by either drought or cold, and thrives well in the shade. It succeeds best on stiff, wet land, and on wet, flooded fields, and will grow fairly well upon rather dry, sandy soil. The rootstocks are very strong and creep extensively, making this grass particularly valuable for binding embankments of rivers and ditches where the water supply is ample. It does not attain its full size until the second year, and if designed for hay should be cut before flowering, for when fully mature the stems become woody and are too hard to make good fodder. The seed, which matures in July and August, is easily gathered, and good seed should have 95 per cent purity and 60 per cent germination. It may be propagated by seed or by cuttings of the rootstocks, these being laid down at intervals of 1 foot, and slightly covered. The retail price of seed quoted in the New York market is $35 per 100 pounds. A variety of this grass, with white-striped leaves, is cultivated in gardens for ornament.

FIG. 70.—Canary-grass. (*Phalaris canariensis.*)

Phalaris canariensis Linn. Canary-grass. (Fig. 70.)

An erect annual, 1 to 3 feet high, with flat leaves, and dense, ovoid panicles or heads about an inch long. This grass is apparently a native of the warmer countries of Europe, also of north Africa and western Asia. It has become widely distributed throughout the tropical regions of the world, including Australia. Cultivated in Germany and southern Europe. It has been introduced into this country and is occasionally cultivated for its seeds, which are used for bird food. The flour from the seeds is utilized in certain processes of cotton manufacture (weaver's glue), and is even employed in the making of some kinds of cake. It is frequently met with in waste grounds about dwellings in the vicinity of towns.

Phalaris caroliniana Walt. California Timothy; Southern Canary-grass; Reed Canary-grass; American Canary-grass; Stewart's Canary-grass; Gilbert's Relief-grass.

This and *Phalaris angusta* have usually been regarded as one species, the latter as a variety with more elongated heads and rather stouter growth. Both the species and variety are perennials, ranging from South Carolina to Florida and westward to Texas, Arizona, California, and northward on the Pacific Slope to Oregon. The variety *angusta* (Fig. 71) is a stout grass, 2 to 5 feet high, and is sometimes called

California Timothy, owing to the resemblance of its heads to those of timothy. In California it is not esteemed as of any agricultural value, but in the Southern States it has been cultivated to a limited extent, and is spoken of by some as being an excellent grass for winter and spring grazing, as it remains green throughout the winter season.

FIG. 71.—California Timothy. (*Phalaris caroliniana.*)

Phalaris intermedia. (See *Phalaris caroliniana.*)

Phleum alpinum Linn. Mountain Timothy; Native Timothy.

This grass is a native of the mountain regions and high altitudes, extending from Maine to California northward; also in northern Europe and Asia. It is closely related to cultivated timothy. The stems are usually stouter, more leafy, but not so tall, under most favorable conditions attaining a height of 2 feet, but rarely exceeding a foot.

Phleum pratense Linn. Timothy; Herd's-grass (in New England); Cat's-tail-grass; Meadow Cat's-tail-grass; Tame Timothy. (Fig. 72.)

This is one of the best known and most extensively cultivated hay grasses. It is a native of Europe, north Africa, and northern and middle Asia, and has become thoroughly naturalized in North America. It appears to have been first cultivated in this country, and it was from this country that the seeds were obtained for its cultivation in England, about the year 1760. It has never attained the same high esteem in England that it holds here, where it is regarded as the standard of comparison for all other grasses grown for hay. It succeeds best on moist loams or clays. In very dry ground the yield is apt to be light. On such soils the base of the stem is often thickened and bulb-like. Timothy is usually sown in mixtures with other grasses and clovers. It may be used with red or alsike clovers, or with red-top. Good fresh seed should have an average purity of 97 per cent and a germinative power of 85 to 90 per cent, a bushel weighing 48 pounds. The amount required per acre varies with the quality of the seed, but of that containing 87 per cent pure in germinating, 16 pounds to the acre is sufficient. It is better, however, to sow half a bushel to the acre if sown alone. With red or alsike clovers about 10 per cent timothy is a proper mixture.

FIG. 72.—Timothy. (*Phleum pratense.*)

Phragmites communis Trin. Common Reed or Reed-grass.

This is one of the largest of our native grasses, growing to the height of 12 feet, the rather stout culms bearing numerous broad, spreading, and sharply pointed leaves 1 to 2 feet long. It has deeply penetrating and extensively creeping root-stocks, making it one of the most valuable grasses for binding the banks of rivers subject to periodical floods. It is occasionally found along the coast in brackish marshes and sometimes upon sandy soils, and possibly may be employed with advantage for binding drifting sands or those liable to be shifted by high tides. The rootstocks are very

strong, and when the grass is once established scarcely anything can remove it. The young shoots are liked by cattle and the mature stems make the best of thatch. It is very widely distributed throughout the temperate regions of both hemispheres, growing along river banks, borders of lakes, etc.

Phragmites roxburghii Kth.

A stout, erect grass, 8 to 12 feet high, with broad, flat leaves, and large, nodding panicles 18 inches long or more. This grass is closely related to our common reed (*Phragmites communis*). It is a native of southern Asia, being common on the plains of northern India, growing near water. The stems are used for making chairs, baskets, and the pipes of Hukahs, and in Bengal mats are made of the split stems. (Duthie.)

Piptatherum multiflorum. (See *Oryzopsis multiflora.*)

Pleuraphis rigida. (See *Hilaria rigida.*)

Poa alpina Linn. Mountain Spear-grass; Mountain Poa.

This is a species of the mountain regions of the New England and Western States, extending northward almost to the limits of polar vegetation. It is a slender perennial, from 1 to 2 inches to 1 foot high, usually about 6 inches, with rather broad leaves and spreading panicles of comparatively large spikelets. Of no recognized agricultural value.

Poa alsodes Gray. Wood Spear-grass.

A slender, erect perennial, 1 to 3 feet high, with flat leaves and a narrow, rather few-flowered panicle. It is a native, growing upon the wooded hillsides of New England, extending westward to Wisconsin, and southward through New York, Pennsylvania, and Virginia, and the mountain regions of North Carolina and Tennessee. It posesses no recognized agricultural value, but is apparently a good fodder grass, and may possibly prove of value in cultivation in woodland parks. Other closely related species of *Poa* extend westward across the continent.

Poa amabilis. (See *Eragrostis amabilis.*)

Poa andina. (See *Poa arida.*)

Poa annua Linn. Low Spear-grass; Spear-grass; Annual Meadow-grass; Dwarf Meadow-grass; Early Meadow-grass; May-grass; Goose-grass; Suffolk-grass; Six Weeks-grass.

A low, spreading annual, with erect or ascending somewhat flattened stems, 2 to 12 inches high. This is an introduced grass, common in every dooryard and about dwellings and cultivated grounds. It may be found in bloom in the Southern States in almost every month in the year. It often forms a considerable ingredient in poorly kept lawns, as a result of its spontaneous growth.

Poa aquatica. (See *Glyceria aquatica.*)

Poa arachnifera Torr. Texas Blue-grass.

A strong-growing perennial, 1 to 3 feet high, with extensively creeping rootstocks, long leaves, and narrow, densely flowered panicles. This grass is apparently dicœcious. The pistillate or seed-bearing plants have the spikelets densely woolly, while the male spikelets are smooth. It is a native of Texas, but is now well known in most of the Southern States, where it has been introduced into cultivation, having been highly recommended as a permanent pasture grass. It may be propagated by seeds or "root cuttings," and these can be obtained from leading seedsmen. It makes its principal growth during the winter months, coming into bloom in the latter part of April or early in May. It makes a good

sod and withstands well the heat of summer and protracted drought. Owing to the woolliness of the seeds, they are difficult to sow, and as they are rather expensive this grass has not been so extensively propagated as it otherwise would have been. A somewhat troublesome, but more certain, method of propagation is by root cuttings. These may be planted at any time during the fall or early spring months, being set out in rows 2 feet apart and 6 to 10 inches apart in the rows. The retail price of the seed, according to New York catalogues, is $3 per pound.

Poa arida Vasey. Bunch Spear-grass; Bunch-grass; Mountain Spear-grass.

A smooth, upright perennial, 1 to 2 feet high, with rather rigid, sharp-pointed leaves, and a close or narrow panicle 2 to 3 inches long. This grass is a native of the Rocky Mountain region, from the British Possessions southward to Arizona. It has short, creeping rootstocks, and although more rigid than many species of *Poa*, it may prove valuable as a pasture grass in the dry regions of the West.

Poa brevifolia. (See *Poa flexuosa.*)

Poa buckleyana Nash. Bunch-grass; Bunch Red-top. (Fig. 73.)

Rather slender, 1 to 2 feet high, with no creeping rootstock, very narrow root leaves, and contracted panicles of usually purplish spikelets. It is a perennial, and a native of the Rocky Mountain regions, growing on the lower foothills and in the valleys. It grows in bunches, not forming a turf, and is regarded by the ranchmen as one of the most valuable "bunch grasses" of the cattle ranges. It has never been introduced into cultivation, but is deserving of attention, for it responds readily to improved conditions, and when growing along streams or in irrigated land makes a luxuriant growth of foliage, and often attains a height of 2 or 3 feet. There are many species of *Poa* native to the northern portion of our country, particularly in the Northwest, and all are tender, nutritious, pasture grasses. Wherever grasses grow, from the seashore to highest mountain tops, from one arctic zone to the other, the genus *Poa* has its representatives.

FIG. 73.—Bunch Red-top. (*Poa buckleyana.*)

Poa cæspitosa Forst. *var.* Silver Tussock.

A large tussock grass, native of Australia and New Zealand, and in the latter country the most abundant of all the tussock grasses. It grows to the height of 3 feet, and has very long, almost filiform, rigid leaves. It is neglected by stock, but the remarkably tough herbage renders it excellent for the manufacture of paper, a purpose for which it is largely employed. (Kirk.)

Poa californica Vasey. California Blue-grass.

Widely distributed in the Rocky Mountain region and on the Pacific Slope, extending southward through Arizona into Mexico. It grows in tufts to the height of 1 to 2 feet, has numerous long root-leaves, and short, compact heads or panicles. It is tender, and affords a large amount of excellent grazing in the regions where it grows abundantly, and may prove a valuable acquisition to the forage grasses of the Atlantic States.

Poa compressa Linn. Creeping Spear-grass; Blue-grass; Smaller Blue-grass; English Blue-grass; Creeping Poa; Wire-grass; Flat-stalked Meadow-grass; Flat-stalked Blue-grass; Canadian Blue-grass.

A slender perennial, with much-flattened stems, 6 to 20 inches high, and small, narrow panicles. This grass has extensively creeping rootstocks, and forms a

strong turf. It is a native of Europe, which has become thoroughly naturalized, and is now very widely distributed over our territory. It is closely related to Kentucky Blue-grass, but is more decidedly blue in color, and is readily distinguished from that species by its strongly flattened stems, lower habit of growth, and smaller panicle. It is the "Blue-grass" of the farmers of the New England and Middle States. It will grow upon a great variety of soils, even upon those so poor and thin as to exclude the growth of other grasses. In cultivated lands it is liable to become troublesome, owing to its creeping rootstocks. There is perhaps no better pasture grass for dry and poor soils, particularly in the Eastern and Middle States. It is especially valuable for dairy pastures; cows feeding on it yield the richest milk and finest butter. On good land it becomes sufficiently tall for hay, and as it shrinks very little in drying, the hay is heavy in proportion to its bulk. Seed is advertised by leading firms at $14 per 100 pounds.

Poa elegans. (See *Eragrostis ciliaris.*)

Poa flabellata Hook. Tussock-grass.

A native of Falkland and adjacent islands, which has attracted the attention of travelers by its stout habit of growth and evident nutritious qualities. The flowering stems are 5 to 8 feet high, and these are often exceeded by the numerous radical leaves. This grass grows in great tussocks, 1 to 4 or 5 feet across. The stems and long leaves are used for thatch. "It loves a rank, wet, peat bog, with the sea spray dashing over it, and wherever the waves beat with greatest vehemence and the saline spray is carried farthest, there the tussock grass thrives the best, provided, also, it is on the soil it prefers." It thrives in cold countries near the sea in pure sand at the edge of peat bogs. The base of the stem is edible, having a taste of mountain cabbage, a species of palm. The introduction of this grass to certain points along our northern seaboard, where other grasses will not thrive or where there is danger of encroachment upon the land by the sea, may be desirable. The nutritious qualities of the grass and its furnishing good fodder the year round upon the Falkland Islands has been repeatedly noted by authors.

Poa flexuosa Muhl. Southern Spear-grass.

A slender, tufted woodland grass, 1 to 3 feet high, ranging from Delaware and Pennsylvania southward, blooming early in the spring. It has no recognized agricultural value, but might be worth cultivating in dry soils under the shade of trees, in which situations it grows naturally.

Poa foliosa Hook. f.

A stout perennial, 2 to 3 feet high, with very long and rather broad leaves, and panicles 6 to 10 inches long. It forms large tussocks, and in habit resembles the Tussock-grass (*Poa flabellata*) of the Falkland Islands. It is less hardy, however, and is spoken of as being a very productive grass of the highest value for fodder or silage.

Poa laxa Haenk. Wavy Meadow-grass; Alpine Meadow-grass.

A slender species, 6 inches to a foot high, found upon the mountain tops in New England and New York, ranging northward. It also occurs on the mountains of Europe. It has no recognized agricultural value.

Poa nemoralis Linn. Wood Meadow-grass.

The larger forms of this are hardly to be distinguished from *Poa serotina*, and have a similar range. It will, however, grow in a drier soil, excessive moisture being harmful to it. In Montana this species ascends to the altitude of 9,000 feet. At this elevation it is dwarfed in habit, but at lower elevations it becomes taller

and affords excellent forage. There are several varieties of this grass in the Rocky Mountains and the Northwest, some of them growing upon the dry foothills and bench lands. The larger forms are well adapted for hay. It is less productive than many others, and its cultivation is not recommended, excepting in shady parks or open woodlands where an increase of forage is desired, or in shaded lawns, and then only in the Northern and Middle States.

Poa pratensis Linn. Kentucky Blue-grass; Blue-grass (in Kentucky and Tennessee); Green-grass; June-grass (in New England); Smooth Meadow-grass; Common Spear-grass; Spear-grass; English-grass; Smooth-stalked Meadow-grass. (Fig. 74.)

This is apparently native throughout the temperate regions of the northern hemisphere. It ranges from Labrador to South Carolina, westward to the Pacific Coast, and northward to Alaska. In the limestone regions of Kentucky and Tennessee it attains its greatest perfection and is there regarded as the king of pasture grasses. It requires a good soil containing some lime, in order to yield profitable crops. It is largely employed in the Eastern and Middle States as a lawn grass, for which use it is well adapted. It makes a good, firm sod, and is particularly well suited for turfing the slopes of terraces and embankments, where the soil is good. There are several varieties, which differ chiefly in the breadth and length of the leaves, particularly those at the base of the stem. It is not so well adapted for the production of hay as it is for pasturage. It should enter into all mixtures designed for permanent pasture. The slender stems of this grass afford an excellent material for the manufacture of the finer kinds of Leghorn hats. Good and well-cleaned seed should have 95 per cent purity and 50 per cent germinating power. The power of germination, however, is usually much below this figure. When used for lawns, sow at the rate of 3 bushels per acre. According to Stebler and Schroeter, the seeds should never be covered, but only rolled after sowing, because they germinate better in the light than in darkness.

FIG. 74.—Kentucky Blue-grass. (*Poa pratensis.*)

Poa serotina Ehrh. False Red-top; Fowl Meadow-grass; Duck-grass; Swamp Wire-grass.

A native of northern Europe and the northern portions of our own country, growing naturally in wet meadows and along the low banks of streams. It attains the height of 2 to 3 feet, or even 4 feet in rich, moist soils, and has an expanded, nodding panicle of rather small, purplish or "bronzed" spikelets. It is found in nearly all parts of New England, and often forms a very considerable and valued portion of the native hay of the low meadows. It has been cultivated to some extent, but should only be used in mixtures, as it does not make a good sod when sown alone. It blooms in July and August.

Poa sudetica Haenke. Silesian Meadow-grass.

A broad-leafed, coarse, and rather stiff *Poa*, with stems 2 to 3 feet high. It is a

native of Europe, growing chiefly in the forests of the mountain regions. It does not succeed well in open meadows, but it may have some value for woodland parks or pastures in the Middle and Northern States.

Poa tenuifolia. (See *Poa buckleyana.*)

Poa trivialis Linn. Rough Meadow-grass; Roughish Meadow-grass; Rough-stalked Meadow-grass; Green-grass; Orcheston-grass; Common Meadow-grass.

An erect perennial, 1 to 3 feet high, with an open, spreading panicle, closely related to Kentucky Blue-grass, from which it differs in having no conspicuous root-stocks and the stem being distinctly rough below the panicle. It has been cultivated for many years in England, and is now highly esteemed as an ingredient in mixtures for permanent pastures. It succeeds best where the climate and soil are rather moist and cool, but is not adapted to sandy soil. In northern Italy this grass is known as the "queen of forage plants," but elsewhere, particularly in this country, it is not so highly esteemed, its principal use being to form bottom grass in permanent pastures. Seed of good quality should have 95 per cent purity and 50 per cent germination. When sown alone 1½ to 2 bushels of seed are required per acre.

Pollinia eriopoda. (See *Ischæmum angustifolium.*)

Pollinia fulva Benth. Sugar-grass.

A slender or rather stout perennial grass, 1 to 4 feet high, with narrow leaves and two to three terminal spikes, which are clothed with brown, silky hairs. It is a native of Australia, found throughout all the colonies of that country, growing chiefly on the richest soils and on deep alluvial flats bordering rivers and creeks. It is productive, and much prized by cattlemen. The name "sugar grass" is applied to this species on account of the sweetness of its stems and foliage. Mr. Fred Turner recommends it for cultivation on good land, especially in grazing districts, and he speaks of it as being a good grass to plant on the banks of rivers, creeks, and dams, as its strong, penetrating roots would help to bind the soil and prevent its being washed away by heavy rains or floods. This grass is classed as a variety of *Pollinia cummingii* Nees, by Hackel.

FIG. 75.—Redfield's-grass. (*Redfieldia flexuosa.*)

Polypogon monspeliensis Desf. Beard-grass.

A smooth annual grass, 6 inches to 2 or 3 feet high, with bearded, one-flowered spikelets crowded in dense spike-like panicles. A native of western and southern Europe, north Africa, western Asia, and India. Introduced into this country; now widely scattered through the Southern States, Southwestern Territories, and California. Of no agricultural value, but sometimes used as an ornamental.

Psamma arenaria. (See *Ammophila arenaria.*)

Redfieldia flexuosa Vasey. Redfield's-grass; Blow-out-grass. (Fig. 75.)

A stout, native perennial, 18 inches to 4 feet high, with long, narrow leaves, and diffusely spreading panicles, growing in the sandy districts of Nebraska, Colorado,

and Kansas. It has deeply penetrating and widely spreading underground stems or rhizomes, making it a valuable species for binding drifting sands. It is a characteristic grass of the sand hills of central Nebraska, growing in the drifting sands and "blow-outs," and is a conspicuous and almost the only grass found on the sand dunes south of the Arkansas River, near Garden City, Kans.

Rottbœllia. Rat-tail-grass.

The native species of *Rottbœllia* are branching, leafy perennials, with slender, cylindrical, many-jointed spikes, which readily break up. They are found chiefly in the pine-barren swamps of the Gulf States. Of little agricultural value in this country. *Rottbœllia compressa*, a native of southern Asia, south Africa, and Australia, where it is called Mat-grass, has creeping or ascending flattened stems, rather short leaves, and slender spikes. In some parts of Australia it is highly esteemed for pasturage, and is said to retain its greenness throughout the year in dry climates. It is not injured by light frosts. The prostrate stems sometimes attain the length of 5 or 6 feet. A closely related species, *R. fasciculata*, occurs on the lower Rio Grande.

Saccharum ciliare Anders.

A tall, handsome grass of India, with smooth stems 8 to 10 feet high, long leaves, and large, showy panicles of silky-hairy flowers. Used in the manufacture of matting, rope, and paper, and for thatching. The stems are made into sieves, screens, and baskets. The thicker portion of the stems is used for lining wells, and in making chairs and couches. The leaves are sometimes used for fodder and when young the grass is grazed by cattle.

Saccharum officinarum L. Sugar cane.

A stout grass with many-jointed stems, 8 to 15 feet high, broad leaves 3 to 4 feet long, and long (16 to 32 inches), pyramidal panicles. Native country unknown, but sparingly spontaneous in the South Sea Islands, where it blossoms freely. Cultivated in all tropical countries, extending northward into Spain and Alabama. Propagated chiefly by cuttings of the stems. There are many varieties, distinguished chiefly by the color and height of stem. The leaves are sometimes used for fodder, and to a limited extent also in paper making. The cane is cultivated, however, for its sweet juice, which yields from 12 to 20 per cent sugar. Under favorable circumstances an acre of ground will produce about 20 tons of cane. In this country the production of cane sugar on a commercial scale is practically limited to the State of Louisiana. The sugar production of that State in 1889 was 292,124,050 pounds. The world's production of cane sugar is about 3,000,000 tons, more than one-third of which is produced by the West Indies. Molasses is a product of sugar cane (the uncrystallizable sugar), and rum is made from molasses. Refuse cane, from which the juice has been expressed, yields a strong fiber, and in parts of India is used for torches, etc.

Saccharum sara Roxb.

Stout, erect, 8 to 14 feet high, with long leaves, the lower ones 4 to 8 feet, and densely flowered panicles 1 to 2 feet long. A native of India. At Jeypoor it is extensively used as a sand binder, for which purpose it has proved well suited.

Saccharum spontaneum Linn.

A stout perennial, 5 to 15 feet high, with extensively creeping rootstocks, long, narrow leaves, and a narrow, woolly panicle 1 to 2 feet long. A native of India where it is a favorite fodder for the buffaloes, and is also given to elephants when young. Where not esteemed too valuable as pasturage for buffaloes it is used for thatching dwellings.

Schedonnardus texanus Steud. Texan Crab-grass; Slender Tail-grass; Crab-grass; Wire-grass.

A low, diffusely branching annual, with short, narrow leaves and slender paniculate spikes. The tufted stems are from 3 inches to nearly 3 feet long. It is a native

ranging from Montana southward to Texas and westward to California. Grows in dry, thin soil, and is of no agricultural value.

Secale cereale Linn. Rye.

An annual, 4 to 6 feet high, with flat leaves and a terminal, somewhat flattened, bearded spike 4 to 6 inches long. The rye crop of the United States in 1895 was 27,210,070 bushels, nearly half of which was produced in the States of Pennsylvania, New York, and Wisconsin. Rye is more largely cultivated in central and northern Europe than in America, and the grain is there very largely used for making bread. It is comparatively little used in this country for that purpose, being chiefly employed in the manufacture of malt liquors. The straw, which is longer than that of other grains, and more uniform in size throughout, is employed in the making of a great variety of articles, such as paper, hats, bonnets, mats, slippers, toys, and fancy articles. Rye straw is little

FIG. 76.—German Millet. (*Setaria germanica.*)

FIG. 77.—Yellow Foxtail. (*Setaria glauca.*)

FIG. 78.—Italian Millet. (*Setaria italica.*)

valued for fodder, but when green it is esteemed as a forage plant, and is sometimes sown for this purpose in the Southern States, cattle being allowed to graze it during the fall and winter months. For winter grazing it should be sown upon well-prepared land early in August, when it will be ready to pasture or to cut green in the latter part of October, and may be grazed throughout the winter months.

Setaria germanica. (See *Setaria italica.*)

Setaria glauca Beauv. Yellow Foxtail; Bottle-grass Foxtail. (Fig. 77.)

An erect annual, 1 to 2 feet high, with flat leaves, and a bristly, cylindrical, spike-like, densely flowered panicle 1 to 3 inches long. This grass is widely distributed throughout the tropical and warmer temperate regions of the world, growing

as a weed in cultivated grounds. It is especially common in the Southern States, where it continues to bloom throughout the season, from June to October. It is distinguished from *Setaria viridis* by its somewhat larger spikelets and more widely spreading yellowish bristles.

Setaria italica Kth. German Millet; Hungarian-grass; Bristly Foxtail; Italian Millet; Bengal-grass; Cat-tail Millet; Golden Millet; Dakota Millet. (Fig. 78.)

This grass, in some of its varieties, has been cultivated in the East for many centuries, and in some parts of India and Trans-Caucasia it still forms an important article of food. Its culture extends back to an early date in Egypt, and in the lake dwellings of the stone age it is found in such quantities that it must be regarded as the main bread supply of the prehistoric peoples (Hackel). In Europe and in this country it is cultivated to some extent for fodder and for the seed, the latter being used chiefly for fowls. It grows rapidly, and may be cut within 60 or 65 days from the time of sowing. If used for fodder, it should be cut just as it begins to head, before blooming, for when more advanced it is apt to be injurious to stock fed upon it. When cut in good season, it is one of the most valuable of soiling plants. *Setaria germanica* (fig. 76) is only a variety of *Setaria italica*, distinguished by its smaller, more compact, and erect heads, the bristles of which are usually purplish. Sow 2 to 3 pecks per acre for hay. One peck is sufficient when sown for seed.

Setaria macrochæta Spr.

An ornamental from India, related to Italian millet, with very long and purple-tinted awns.

Setaria verticillata Beauv. Bristly Foxtail; Stickers.

Has about the same wide distribution as *Setaria glauca*, but is much less common in the United States. It is rarely found except in waste town lots and about dwellings in the Atlantic States. The bristles in this species are barbed downward, on account of which the "heads" cling to clothing or other objects with which they may come in contact. A weed.

Setaria viridis Beauv. Green Foxtail; Pigeon-grass; Green Pigeon-grass; Bottle-grass; Wild Millet.

Similar in habit to *Setaria glauca*, with about the same distribution, and equally common in this country, appearing as a weed in all cultivated grounds. It begins to bloom a little earlier than the Yellow Foxtail, the more numerous spikelets are smaller, the head or panicle less erect, and the bristles usually green, not yellow, as in that species. The stems are very tough and may be utilized for making paper.

Sieglingia sp. (See *Triodia*.)

Sorghum cernuum. Chicken Corn; Guinea Corn; White Egyptian Corn. (See *Andropogon sorghum.*)

Sorghum halepense. (See *Andropogon halepensis.*)

Sorghum nutans. Indian-grass; Wood-grass; Oat-like Indian-grass. (See *Andropogon nutans.*)

Sorghum saccharatum. Sweet Sorghum; Chinese Sugar cane; African Cane; Broom Corn. (See *Andropogon sorghum.*)

Sorghum vulgare (now referred to *Andropogon sorghum* Brot. var. *vulgaris*). Sorghum; Sugar Cane; Broom Corn; Indian Millet; Chinese Wheat; Ivory Wheat; Pampas Rice; Chinese Sugar Cane; African Corn; Guinea Corn; Doura Corn; Chocolate Corn; Great Millet; Oregon Rice. (See *Andropogon sorghum.*)

Spartina cynosuroides Willd. Cord-grass; Fresh-water Cord-grass; Marsh-grass; Bull-grass; Thatch-grass; Slough-grass. (Fig. 79.)

Stout, with erect, simple stems 2 to 9 feet high, flat and long-pointed leaves, and numerous erect or spreading spikes 2 to 5 inches long. This is a native, common along our ocean and lake shores, borders of rivers, etc., ranging from Maine to the Carolinas, and westward to the Pacific. It makes a fair but rather coarse hay when cut early, and has been successfully employed in the manufacture of paper. The strong, creeping, scaly rootstocks of this grass adapt it for binding loose sands and river embankments.

FIG. 79.—Cord-grass. (*Spartina cynosuroides.*)

Spartina gracilis Trin. Slender Cord-grass.

A species of the plains and Rocky Mountain regions, much resembling the common Fresh-water Cord-grass, although usually smaller. It is a hard, tough grass, with strong, creeping rootstocks, and usually grows in sandy, alkaline soil. The tough leaves and stems may possess some value for paper making.

Spartina juncea Willd. Fox-grass; White Rush; Marsh-grass; Salt-grass; Red Salt-grass; Salt Marsh-grass; Rush Marsh-grass. (Fig. 80.)

A rather slender species, 1 to 2 (rarely 3 to 4) feet high, with two to four slender, erect, or widely spreading spikes. This is common upon the salt marshes, and is one of the most valued species which go to form the salt hay that these marshes produce. It ranges from Maine southward to Florida and along the Gulf coast to Texas. It is useful for packing glassware, crockery, etc., and in the larger towns along the coast is much used for this purpose. Fox-grass and Black-grass (*Juncus gerardi*) are regarded as the best of the grasses of the salt marshes for the production of hay, and chemical analyses have proven the correctness of this opinion. Salt hay, composed chiefly of these grasses, at average market prices is decidedly cheaper than timothy hay.

FIG. 80.—Fox-grass. (*Spartina juncea.*)

Spartina polystachya Willd. Salt Reed-grass.

This resembles Fresh-water Cord-grass, but is usually of larger growth, and has more numerous spikes, often as many as 50 or 60. It is limited to the salt and brackish marshes of the Atlantic Coast, ranging from Maine to Florida.

Spartina stricta Roth. Creek-sedge; Branch-grass; Thatch; Sedge. (Fig. 81.)

An erect and often stout salt marsh grass, with flat leaves, and few to many erect spikes. It varies a good deal in size, the larger form attaining a height of 5 to 8 feet. It grows along the ditches and creeks of the marshes, and is conspicuous by its size, and long, shining leaves, which are of a deep-green color. Smaller forms are found over the marshes away from the ditches, and these often are of a pale green tint, with comparatively short and shining leaves. All the forms are somewhat succulent,

Sporobolus junceus Kunth. Rush-like Drop-seed-grass; Wire-grass.

Common in the dry, pine-barren regions of the Southeastern States. It grows to the height of 18 inches to 2 feet, and is of little or no agricultural value. This and *Aristida stricta* are the grasses known throughout the South as "Wire-grass."

Sporobolus orientalis Kth. Usar-grass.

A wiry, creeping perennial, with rather short, rigid leaves and diffuse panicles. It is a native of India, growing upon saline soils, often constituting the entire vegetation of the extensive usar tracts of northern India. A valuable grass for alkaline or saline soils, yielding a liberal supply of fodder where other plants are unable to exist.

Sporobolus serotinus. Late Drop-seed-grass.

A very slender, delicate grass, common in moist, sandy soils from Maine to New Jersey and westward to Michigan. Of no agricultural value.

Sporobolus vaginæflorus Vasey. Southern Poverty-grass; Prairie-grass.

A slender, tufted annual, 6 to 18 inches high, with very short narrow leaves and nearly simple, few-flowered panicles, which are mostly inclosed within the leaf sheaths. This grass grows in dry, poor soils throughout the Atlantic States, extending westward to Missouri and southern Texas. Of little or no agricultural value.

Sporobolus wrightii Munro. "Zacaton," or "Zacate"-grass; Saccatone; Maton (of the Mexicans). (Fig. 84.)

A stout, erect perennial, 4 to 8 feet high, with long, narrow leaves and a slightly spreading panicle 12 to 15 inches long. It grows in great clumps, producing a large quantity of coarse, tough stems and leaves, which, however, in the regions where this grass is native—Arizona and New Mexico—yield a hay which is valued for horses and mules. As a hardy perennial for saline bottoms subject to flooding or incapable of cultivation, this species deserves notice. The Indians and Mexicans of Arizona and Lower California call all hay grasses "zacate," without any distinction between the species.

FIG. 84.—Saccatone. (*Sporobolus wrightii.*)

Stenotaphrum americanum Schk. Hard-grass; St. Augustine-grass; Mission-grass; Buffalo-grass (in Australia); Pimento-grass (in Jamaica). (Fig. 85.)

This grass has a wide distribution, being found in the tropical and warmer temperate regions of both the Old and New World. In New South Wales it is known as Buffalo-grass, and in Jamaica it is called Pimento-grass. It grows upon every variety of soil, from the apparently sterile sand dunes to heavy clays, but is rarely found far away from the coast. The flattened stems emit fibrous roots at every joint, where they also readily separate, each piece becoming a new center of growth. The leaves are flat or simply folded, blunt or obtuse at the apex, nearly one-fourth of an inch broad and 4 to 10 inches long. The flowering stems grow to the height of 6 inches to a foot or more. St. Augustine-grass grows along our ocean shores as far north as South Carolina, and is extensively used for lawns in Charleston, S. C., and cities in the South near the coast. It is useful for holding sloping embankments, especially those subject to wash. It

is propagated by cuttings or sets, and quickly covers the most sandy yards with a dense, carpet-like growth. In South America the creeping stems are employed in medicine as a diuretic.

Stipa avenacea Linn. Black Oat-grass; Feather-grass.

An erect perennial, 1 to 3 feet high, with very narrow leaves and a loose panicle with a few long-awned spikelets. It grows in dry soil in open woods along thicket borders, ranging from New England to the Southern States and westward to Texas and Wisconsin. Of no agricultural value.

Stipa comata. Needle-grass; Feather-grass; Bunch-grass; Needle-and-Thread.

This is one of the bunch grasses common in the Rocky Mountain region, growing on the dry mesas and foothills. It is a rather stout, leafy perennial, 1 to 3 feet high, with a panicle usually partly inclosed in the upper leaf sheath; the slender awns of the spikelets are 4 to 6 inches long and flexuose. This grass has some value, affording forage of good quality in the regions where it grows abundantly.

Stipa elegantissima Labill.

A native of Australia, with erect, branching stems 2 to 3 feet high, narrow leaves, and loose panicles 6 to 8 inches long. The axis and long, thread-like branches of the panicle are elegantly plumose with fine, spreading hairs, rendering it highly ornamental. Cultivated in gardens.

Stipa pennata Linn. Feather-grass.

A native of Southern Europe, 1 to 2 feet high, growing in dry, open ground, and often cultivated in gardens as an ornamental, the very long, slender awns being clothed with spreading, silky hairs, presenting a very graceful plume-like appearance. A variety of this grass (*Stipa pennata* var. *neo-mexicana*) grows wild in the mountain regions of western Texas and Arizona. It is an elegant form of the species, growing in clumps 6 to 12 inches in diameter, and is deserving the attention of the florist.

FIG. 85.—St. Augustine-grass. (*Stenotaphrum americanum.*)

Stipa setigera Presl. Bear-grass; Bunch-grass.

A native of California, extending northward to Oregon and eastward through New Mexico and Arizona to Texas. It is common on the coast ranges and on the foothills of the Sierra Nevada, where it is regarded as one of the most valuable of the native bunch grasses.

Stipa spartea Trin. Porcupine-grass; Devil's Darning-needles; Devil's Knitting-needles; Spear-grass; Arrow-grass; Buffalo-grass (in the Saskatchewan region).

Rather stout, 18 inches to 3 feet high, with long leaves and few-flowered panicles. The stout and twisted awns are 3 to 6 inches long, and at the base of the flowering glume is a long and very sharp-pointed callus. When mature, the awned flowering glumes soon fall off, leaving the large, pale, straw-colored persistent empty glumes, which impart to the panicle a characteristic oat-like appearance. The awns, when dry, are bent and very strongly twisted, but when moistened they gradually untwist, a character which enables the seeds to bury themselves in the ground, this being possible on account of the very sharp callus at the base of the fruiting glume. The same character also renders the seeds of this grass

dangerous to sheep, as they readily become attached to the wool, and may penetrate the flesh of the animal, causing serious injury. Aside from this danger of affecting the quality of the wool, and possibly the life of the sheep, this grass may be considered a good forage plant, as it makes a very good hay, although somewhat coarse. It is particularly common in the prairie regions of Iowa, Nebraska, South Dakota, and Minnesota, extending westward to the Rocky Mountains, where it frequently occurs upon the dry foothills and bench lands.

Stipa tenacissima Linn. Esparto-grass.

A native of the sandy regions of southwestern Europe and northern Africa. It is a tall perennial, with long, stiff, and very tough leaves, from which ropes, baskets, mats, hats, and other articles are woven. The leaves are employed largely in England and this country in the manufacture of paper, for which purpose this grass is superior to straw. It is the most important article of export from Algeria, and from northern Africa and Spain more than 2,000 tons of Esparto are exported to Great Britain annually. "Ten tons of dry Esparto, worth from $18 to $25 per ton, can be obtained from an acre under favorable circumstances." The grass will grow on almost any kind of soil, from that which is poor and sandy or gravelly to heavy calcareous and clayey soils. It thrives in the dry and hot climates of northern Africa, where many millions of acres are covered almost exclusively with it. This grass is extensively cultivated in the south of France, and possibly its introduction into some of our Southwestern districts may render profitable, regions now practically worthless. It may be propagated by seeds or by divisions of the root. The latter is the more common method. (See *Lygeum spartum.*)

Stipa viridula Trin. Feather Bunch-grass; Bunch-grass; Wild Oat-grass; Wild Oats; Feather-grass. (Fig. 86.)

A rather slender grass, except in the variety noted below, 1 to 3 feet high, growing in the Rocky Mountain regions and on the foothills and mesas, from British Columbia southward to Mexico and westward to the coast. On good land, under irrigation, this grass attains the height of 3 feet or more, and is by far the most valuable of the Stipas for hay. The leafy culms are terminated by a narrow, many-flowered panicle of comparatively small and rather short-awned spikelets. The seed may be easily gathered. The callus at the base of the fruiting glume is short and barely pointed and not produced into a long, very sharp, spur-like extension, as in Porcupine-grass. A variety of this species, called Sleepy-grass, occurs in the mountain valleys of western Texas, ranging northward to Colorado. It is a robust form, 3 to 6 feet high, and when green is said to have a narcotic effect upon horses and cattle feeding upon it.

Themeda ciliata. (See *Anthistiria ciliata.*)

Thuarea sarmentosa Pers.

A low, extensively creeping grass, rooting at the joints, with ascending flowering branches, short leaves, and slender spikes about an inch long. A native of Ceylon, northern Australia, etc., growing on the sands of the coast. It is a tender grass, and may be useful in binding coast sands in tropical countries or in the formation of lawns.

Thysanolæna acarifera Nees. Tiger-grass.

A tall and showy species of southern Asia, with large panicles of minute spikelets. It becomes a weed among cultivated crops. A decoction of the root is used as a rinse for the mouth in cases of fever.

Trichloris blanchardiana Scribn.

A perennial, 1½ to 3 feet high, with flat leaves, and six to eighteen slender, bearded spikes, which are 2 to 5 inches long, digitate or fasciculate at the apex of the

culm. It has long been known to florists under the name of *Chloropsis blanchardiana*, and is esteemed as an ornamental grass, its attractive appearance making it worthy of attention. It grows in Arizona and Mexico, extending into South America.

Tricholæna rosea Nees.

A South African annual (?), with diffusely branching stems 2 to 4 feet high. The spikelets are in loose panicles, and clothed with reddish, silky hairs. It presents a pleasing appearance when in flower, and the panicles are valued for dry bouquets. It has recently received some attention by agriculturists on account of its very vigorous, rapid growth and productiveness. Experiments made in this country and elsewhere indicate that it possesses much value as a meadow or hay grass in mild climates. Three hundred stems have been counted on a single plant. These stems take root wherever they touch the ground, and an acre has been calculated to yield 30 tons of green fodder in the rich valleys of the Macleay River, New South Wales. It is easily propagated by seed.

Tricuspis seslerioides. (See *Triodia cupræa.*)

Triodia acuminata H. B. K. White Tuft-grass.

A native of the arid regions of Texas, New Mexico, and Arizona, growing in dry, gravelly soil on the mesas and foothills. It is a low, tufted perennial 4 to 12 inches high, with a short, spike-like panicle composed of a few crowded spikelets. It produces numerous root leaves, but is of comparatively little value as a forage plant.

Triodia cupræa Jacq. Tall Red-top; Fall Red-top; Purple-top.

A stout, erect native perennial, 3 to 5 feet high, with long, flat leaves and an ample, spreading, usually purple panicle 6 to 12 inches long, growing in dry or sandy fields from southern New York southward and westward to Missouri, blooming in August and September. It is a striking grass, and often covers considerable areas, but is apparently not liked by stock, and is not recognized as posessing any agricultural value.

Fig. 86.—Feather Bunch-grass. (*Stipa viridula.*)

Triodia exigua Kirk.

A little alpine grass endemic in New Zealand. It forms even plots of turf, often many square yards in extent; the leaves are firm, short, and shining; the compact growth of the turf or sward prevents the encroachment of other grasses or weeds. It is particularly to be recommended for croquet lawns, never requiring mowing (Th. Kirk). In the mountain regions of the West are several of these small turf-forming grasses, which would, if cultivated, make excellent carpet-like lawns in the region of the Northern and Middle States.

Triplasis purpurea Chapm. Purple Sand-grass; Sand-grass.

A native annual, common in the sands along the coast from Massachusetts southward and extending westward to Illinois and Texas. It has rather slender, wiry stems growing in tufts 6 to 12 inches high, and numerous short, spreading

leaves. The slender, few-flowered panicles are for the most part included within the leaf sheaths. The fresh stems have an acid taste. Of no agricultural value.

Tripsacum dactyloides Linn. Gama-grass; Sesame-grass; Bull-grass. (Fig. 87.)

A tall, coarse perennial, 3 to 8 feet high, growing in large tufts, and producing a great mass of broad leaves, which when young and succulent are eaten with avidity by all kinds of stock. When abundant it affords a large amount of natural forage, and is valuable to this extent. It has very strong, creeping rootstocks, and the quantity of forage produced is large and of excellent quality. The grass may be deserving of cultivation for forage under certain conditions, and it makes an interesting and attractive plant for lawn decoration or the garden. A rich and rather moist soil is best suited to it.

Triraphis mollis R. Br. Purple Heads.

A native of Australia, 1 to 2 feet high or more, with narrow, dense panicles 6 to 10 inches long. It is a perennial, growing chiefly in the arid districts of the interior, and may prove valuable for propagation in such regions because of its drought-resisting qualities. Its habit of growth and purplish heads render it quite attractive in appearance, and it has been recommended as an ornamental grass.

Trisetum flavescens. (See *Trisetum pratense.*)

Trisetum palustre Linn. Marsh Oat-grass.

A smooth, upright, native perennial, not infrequent in moist meadows in low grounds, ranging from southern New York southward and westward to Illinois. The slender stems attain the height of 2 or 3 feet and bear loosely flowered, narrow, yellowish-green panicles. This plant has never been cultivated, but it may possess some value as an ingredient in mixtures for permanent pastures.

Trisetum pratense Pers. Yellow Oat-grass; Golden Oat-grass.

A rather slender, loosely tufted perennial, growing to the height of 2 feet. It is a native of Europe, northern Africa, and western Asia. It occurs along roadsides, in open fields, and on grassy mountain slopes, where its presence is said to indicate land of good quality. In Europe Yellow Oat-grass is classed with the best fodder plants and is highly valued for temporary, but more particularly for permanent pastures. It can be grown on almost every variety of soil, is fairly productive, and is readily eaten by stock. This grass has a record of yielding on clayey loam soils 8,167 pounds green grass, 2,858 of hay, and 4,083 of aftermath. In this country it has received little attention. It is quoted in New York seed catalogues, the price ranging from $70 to $115 per 100 pounds. Sown only in mixtures.

Trisetum subspicatum var. **molle** Gray. Downy Persoon; Downy Oat-grass.

A slender, erect perennial, 6 to 15 inches high, with soft-downy stems and leaves and a contracted, spike-like panicle 2 to 5 inches long. It is a native of the cooler regions of New England, extending southward along the mountains to the Carolinas. It is common also in the Rocky Mountains from Colorado northward. Of no agricultural value.

Tristeginis glutinosa. (See *Melinis minutiflora.*)

Triticum caninum. (See *Agropyron caninum.*)

Triticum polonicum Linn. Wild-goose Wheat; Montana Rye.

A very striking species or variety of wheat, with large, compressed, and usually bluish-green spikes or heads. The native country of this *Triticum* is not known, but it probably originated in Spain, where it is now cultivated to a considerable extent. It is also cultivated more or less in Italy and Abyssinia. The long and slender fruit resembles rye, but is on the whole larger. It has sometimes been

advertised by some dealers and sold to farmers under the name of Giant Rye. It is inferior to many other varieties, for, although the heads present a fine appearance, the production of kernels is small; consequently the yield of grain is light.

Triticum repens. (See *Agropyron repens.*)

Triticum sativum Linn. Wheat.

This and its many varieties which have been produced by cultivation is one of, if not the most important of the true grasses. It is one of the oldest of the cultivated cereals, the grains having been found in very ancient Egyptian monuments, dating back to 2,500 to 3,000 B. C. The numerous varieties are distinguished by the firmness of the axis of the spike (continuous), or its brittleness

FIG. 87.—Gama. (*Tripsacum dactyloides.*)

FIG. 88.—Broad-leafed Spike-grass. (*Uniola latifolia.*)

(articulated); by the presence or absence of awns or beard; by the color of the chaff, and color and size of the grain. *Triticum satirum spelta*, of which there are a number of subvarieties, is one of the oldest grains, and was everywhere cultivated throughout the Roman Empire, forming the chief grain of Egypt and Greece. It is still grown to some extent in parts of Europe, notably in northern Spain and southern Germany. In 1895 the wheat crop of the United States was placed at 467,102,947 bushels, while the wheat crop of the world is estimated at 2,400,000,000 million bushels. For a discussion of the classification of the varieties of wheat, see Hackel's True Grasses (English translation), and the Fourth Annual Report of the New York Agricultural Experiment Station, 1885.

Uniola gracilis Michx. Slender Spike-grass.

Slender, 2 to 3 feet high, with long, narrow leaves and contracted, wand-like, nodding panicles 6 to 18 inches long. This is a native perennial, growing in dry soil

along the borders of woods and open thickets, ranging from New York southward near the coast and westward to Tennessee. It is of no recognized agricultural value.

Uniola latifolia Michx. Broad-leafed Spike-grass; Wild Fescue-grass; Wild Oats. (Fig. 88.)

Erect, with rather stout, leafy stems 2 to 4 feet high, and drooping panicles of large, flat spikelets. The leaves are broad and widely spreading, and these, together with the graceful, nodding, open panicles, render it pleasing in appearance and worthy of cultivation for ornament. It has very strong, creeping roots, and is found chiefly along streams and thicket borders from Pennsylvania southward and westward to Illinois. A grass of little or no agricultural value.

Uniola palmeri Vasey.

A stout perennial with branching stems 2 to 4 feet high growing in the tidewater marshes at the mouth of the Colorado River. The seeds form one of the principal food grains of the Cocopa Indians of southern California.

Uniola paniculata Linn. Seaside Oats; Beach-grass; Spike-grass.

A native, with stout, erect stems 3 to 5 feet high, long, rigid leaves, and showy nodding panicles of broad, pale straw-colored spikelets. The panicles are gathered for dry bouquets, and are often seen in our markets, along with the plumes of Pampas-grass. It grows in the drifting sands along the seashore, just above high tide, from Virginia southward to Florida, and along the Gulf Coast westward to Texas. It is an excellent sand binder, its rootstocks being very strong and penetrating deeply into the soil, much like those of Beach or Marram grass, of which it is a southern analogue. The leaves are sometimes cropped by cattle, but the grass is too tough and dry to be of any importance as a forage plant. *Uniola condensata* of similar habit of growth, but with more densely flowered panicles, is found in the sands along the coast of southern California.

Zea gracillima var. variegata Hort.

A garden variety of Maize with variegated leaves.

Zea mays Linn. Indian Corn or Maize.

One of the most valued of the cultivated cereals. The many varieties which have originated in cultivation have been variously classified. They differ much in size, in the form, size, color, and hardiness of the grain, and in the time required for ripening. Husk Maize, in which the kernels are separately enveloped in broad, herbaceous glumes, may approach the native form, which doubtless had its origin in tropical America. *Mais de coyote*, regarded by some as a distinct species, is said to grow wild in some parts of Mexico. The stems of this variety are branched above, and the numerous small ears are borne in the upper leaf axils all along the branches. The kernels are rounded and depressed, or conical with a rather acute apex pointing forward in two opposite rows, or irregularly arranged in four to six rows. Aside from its great value as a cereal, ordinary field corn is the best of the annual forage plants for soiling, and is also valued and used by many farmers for ensilage, being cut for this purpose when the kernels commence to glaze. Among the many uses of corn may be mentioned that of making cakes and corn bread, mush or hasty pudding, which is boiled corn meal, a very common dish in New England; mixed with rye and wheat flour the corn meal is used in making "brown bread"; green corn, boiled or roasted, is very largely eaten in its season, and canned corn is an important article of food; pickled green corn also is a favorite dish with many; hulled corn, or hominy, prepared by soaking the ripe grain in lye for a certain length of time and then removing the hulls or covering of the kernels, is a favorite dish in New England;

popped corn, obtained by shaking the shelled corn of certain varieties in a suitable dish over live coals or a hot stove, is a luxury with children, and mixed with sugar or sirup is made into corn balls and various kinds of candy; corn and corn meal are largely fed to farm stock in this country, particularly to cattle and hogs; alcoholic liquors in immense quantities are distilled from the grain; corn husks (the leaves covering the ears) are used in making paper, in upholstery, and for filling mattresses. The total corn crop of the United States for the year 1895 was 2,151,138,580 bushels, valued at $544,985,534. The largest crop of any one State for that year was produced by Iowa, and amounted to 298,502,650 bushels.

Zizania aquatica Linn. Indian Rice; Wild Rice; Water Rice; Tuscarora Rice; Water Oats; Reed. (Fig. 89.)

A tall, erect annual, 3 to 10 feet high, growing in shallow water along rivers and lakes from Canada southward to Florida and westward to Texas. The grain is a favorite food of the reed bird, and the grass is cultivated to some extent by sportsmen with a view to attracting these and aquatic fowl. It grows very rapidly in 1 to 8 feet of water, and matures its seeds in August or early in September. It succeeds best when sown in the fall broadcast in 2 or 3 feet of water having a muddy bottom, but it can be sown in the spring in water from 6 inches to 5 feet deep. Before sowing soak the seeds in water twenty-four hours. Current retail price of the seeds is 25 cents per pound. This grass is abundant in the tide-waters of the rivers of the Middle States, notably in the Delaware below Philadelphia, where it is always designated as "the reeds." The stems are used by coopers for making the joints of barrels intended to hold whisky or petroleum perfectly tight. This grass is the *Manorrin* of the Chippewa Indians, who gather the grain for food.

FIG. 89.—Indian rice. (*Zizania aquatica.*)

Zoysia pungens Willd. Coast Couch-grass; Japanese Lawn-grass.

A creeping maritime grass growing on the sandy shores of tropical and eastern Asia, Australia, and New Zealand. In Australia it is considered an excellent sand-binder, and while valuable for this purpose, it is at the same time an excellent forage plant. Under favorable circumstances it forms a compact turf and affords a large amount of choice pasturage. Constant cropping appears to improve it and increase the density of the turf. In the foreign settlements of China and Japan it is prized as a lawn grass, especially for tennis courts. It is finer-leafed than St. Augustine-grass, and may prove superior to that for lawns in the Southern and Gulf States. The habit of growth of Japanese lawn-grass is very similar to that of Bermuda, but the creeping stems are rather stouter and more rigid and the upright branches or tufts of flowering stems are never so tall, rarely exceeding 6 inches. It may be propagated by root cuttings or by seed. Importations of both roots and seeds from Korea have been successfully grown here, and the grass has proved hardy as far north as Connecticut. The leaves turn brown in the autumn as do those of Bermuda.

COMMON ENGLISH OR LOCAL NAMES OF GRASSES.

[This list serves as an index to the Latin names, which are arranged alphabetically in the body of the work.]

African Cane. *Pennisetum spicatum.* (See page 74.)

Millet. *Eleusine coracana.*

Sugar Cane. *Sorghum saccharatum.*

Alabama Guinea-grass. *Andropogon halepensis.*

Albardine. *Lygeum spartum.*

Alfa-grass. *Stipa tenacissima.*

Alkali-grass. *Distichlis maritima.*

Alpine Meadow-grass. *Poa laxa.*

American Canary-grass. *Phalaris caroliniana.*

Millet. *Setaria italica.*

Andes, Grass of the. *Arrhenatherum elatius.*

Angola-grass. *Panicum spectabile.*

An-kee. *Panicum crus-galli.*

Annual Meadow-grass. *Poa annua.*

Apache Blue-grass. *Agropyron divergens.*

Arabian Millet, or **Arabian Evergreen Millet.** *Andropogon halepensis.*

Arctic-grass. *Bromus unioloides.*

Arrow-grass. *Stipa spartea.*

Austin-grass. *Panicum texanum.*

Australian Millet. *Andropogon halepensis.*

Oats. *Bromus unioloides.*

Prairie-grass. *Bromus unioloides.*

Austrian Brome-grass. *Bromus inermis.*

Awned Wheat-grass. *Agropyron caninum.*

Awnless Brome-grass. *Bromus inermis.*

Bahama-grass. *Cynodon dactylon.*

Bajree Millet. *Pennisetum spicatum.*

Barley. *Hordeum sativum.*

Barley-grass. *Hordeum pusillum; H. murinum.*

Wild. *Hordeum pratense.*

Barn-grass. *Panicum crus-galli.*

Barnyard-grass. *Panicum crus-galli.*

Millet. *Panicum crus-galli.*

Beach-grass. *Ammophila arundinacea; Uniola paniculata.*

Bear-grass. *Stipa setigera.*

Beard-grass. *Polypogon monspeliensis; Aristida purpurea; A. purpurascens; A. virgata.* Also applied to species of *Andropogon.*

Cluster-flowered. *Andropogon macrourus.*

Creeping. *Oplismenus setarius.*

Finger-spiked. *Andropogon provincialis.*

Naked. Generic name for species of *Gymnopogon.*

Satin. *Muhlenbergia sylvatica.*

Short-leafed. *Gymnopogon brevifolius.*

Silver. *Andropogon argyræus.*

Virginia. *Andropogon virginicus.*

Western. *Aristida purpurea.*

Woolly. *Erianthus saccharoides.*

Bearded Darnel. *Lolium temulentum.*

Wheat-grass. *Agropyron caninum.*

Beckman's-grass. *Beckmannia erucæformis.*

Bene. *Andropogon squarrosus.*

Bengal-grass. *Setaria italica.*

Bent-grass, (or **Bent**) Generic name for species of *Agrostis.*

Panic. *Panicum agrostoides.*

Rough-leafed. *Agrostis asperifolia.*

Bent, Blue. *Andropogon provincialis.*

Brown. *Agrostis canina.*

Creeping. *Agrostis stolonifera.*

Dog's. *Agrostis canina.*

English. *Agrostis alba.*

Fine. *Agrostis vulgaris.*

Marsh. *Agrostis alba.*

Purple. *Calamovilfa brevipilis.*

Reed. *Calamagrostis canadensis.*

Rhode Island. *Agrostis vulgaris; A. canina.*

Rough. *Agrostis scabra.*

Southern. *Agrostis elata.*

Spider. *Agrostis arachnoides.*

White. *Agrostis alba; Andropogon scoparius.*

Woolly. *Calamovilfa longifolia.*

Bermuda-grass. *Cynodon dactylon.*

Bhabur-grass. *Ischæmum angustifolium.*

Big Blue-stem. *Andropogon provincialis.*

Bitter Panic-grass. *Panicum amarum.*

Black Bent. *Panicum virgatum.*

Bunch-grass. *Hilaria jamesii.*

-fruited Mountain Rice. *Oryzopsis melanocarpa.*

Grama. *Bouteloua oligostachya; Muhlenbergia pungens; Hilaria mutica.*

Oat-grass. *Stipa avenacea.*

Blady Grass. *Imperata arundinacea.*

Blow-out-grass. *Redfieldia flexuosa; Eragrostis tenuis; Muhlenbergia pungens.*

Blue Bent (of Rhode Island). *Andropogon provincialis.*

Grama. *Bouteloua oligostachya.*

Blue-grass. *Poa pratensis; Poa compressa; Andropogon provincialis; Agropyron spicatum; Andropogon affinis.*

Apache. *Agropyron divergens.*

English. *Poa compressa; Festuca elatior.*

Kentucky. *Poa pratensis.*

Smaller. *Poa compressa.*

Texas. *Poa arachnifera.*

Blue-joint-grass. *Calamagrostis canadensis; Agropyron spicatum; Andropogon provincialis.*

Blue-stem. *Agropyron spicatum; Andropogon provincialis.*

Big. *Andropogon provincialis.*

Bushy. *Andropogon nutans.*

Colorado. *Agropyron spicatum.*

Little. *Andropogon scoparius.*

Bonnet-grass. *Agrostis alba.*

Borden's-grass. *Agrostis vulgaris.*

Bottle Brush. *Asprella hystrix.*

-grass. *Setaria glauca; S. viridis.*

Bottom-grass. *Panicum texanum.*

Branch-grass. *Spartina stricta* var. *glabra.*

Branching Foxtail. *Chloris verticillata.*

Spear-grass. *Eragrostis tenuis.*

Bristly Foxtail. *Setaria italica; S. verticillata.*

Muskit or **Mesquit.** *Bouteloua hirsuta.*

Brome-grass. Generic name for species of *Bromus.*

Fringed. *Bromus ciliatus.*

Smooth. *Bromus racemosus.*

Soft. *Bromus mollis.*

Western. *Bromus pumpellianus.*

Willard's. *Bromus secalinus.*

Brook-grass. *Andropogon macrourus.*

Broom Corn. *Andropogon sorghum,* variety.

Corn Millet. *Panicum miliaceum.*

-grass. *Andropogon scoparius; A. virginicus.*

Sedge. *Andropogon virginicus.* Also applied sometimes to *Andropogon scoparius.*

Brown Bent-grass. *Agrostis canina.*

Millet. *Panicum miliaceum.*

-top. *Agrostis,* species growing on the salt marshes.

Brush, Bottle. *Asprella hystrix.*

Buffalo-grass. *Buchloë dactyloides; Bouteloua oligostachya; Panicum texanum; Stipa spartea* (in the Saskatchewan region); *Stenotaphrum americanum* (in Australia).

Bunch-grass. *Festuca scabrella.*

Bull-grass. *Spartina cynosuroides* and *Paspalum plicatulum; Tripsacum dactyloides.*

Bulrush Millet. *Pennisetum spicatum.*

Bunch-grass. *Oryzopsis cuspidata; Poa buckleyana; Stipa viridula; S. comata; Sporobolus heterolepis; Calamagrostis sylvatica*, etc. This name is applied by the ranchmen in the West to many of the native grasses.

Buffalo. *Festuca scabrella.*

Early. *Eatonia obtusata.*

Feather. *Stipa viridula.*

Great. *Festuca scabrella.*

Pine. *Festuca ovina*, variety.

Wire. *Agropyron divergens.*

Bunch Hair-grass. *Muhlenbergia trichopodes.*

Red-top. *Poa buckleyana.*

Spear-grass. *Poa arida.*

Burden's-grass. *Agrostis vulgaris; A. canina.*

Bur-grass. *Cenchrus tribuloides.*

Bushy Blue-stem. *Andropogon nutans.*

Buzzard-grass (local). *Eleusine indica.*

Caffre Corn. *Andropogon sorghum* variety.

Calf-kill. *Holcus lanatus.*

California Oat-grass. *Danthonia californica.*

Timothy. *Phalaris caroliniana.*

Canada Lyme-grass. *Elymus canadensis.*

Canadian Small-reed. *Calamagrostis canadensis.*

Canary-grass. Generic name for species of *Phalaris;* applied especially to *Phalaris canariensis.*

Reed. *Phalaris arundinacea; P. caroliniana.*

Southern. *Phalaris caroliniana.*

Stewart's. *Phalaris caroliniana.*

Candy-grass. *Eragrostis minor.*

Cane. *Arundinaria gigantea.*

African. *Pennisetum spicatum;* the same as *P. typhoideum.*

Chinese Sugar. *Andropogon sorghum.*

Large. *Arundinaria macrosperma.*

Maiden. *Panicum curtisii.*

Small. *Arundinaria tecta; Panicum divaricatum.*

Sugar. *Saccharum officinarum.*

Carpet-grass. *Sporobolus indicus; Paspalum platycaule.*

Catch-fly-grass. *Leersia lenticularis.*

Cat's-tail-grass. *Phleum pratense.*

Cat-tail Millet. *Pennisetum spicatum; Setaria italica.*

Chandler's-grass. *Agropyron repens.*

Charleston Lawn-grass. *Stenotaphrum americanum.*

Cheat. *Bromus secalinus.*

Chess. *Bromus secalinus.*

Soft. *Bromus mollis.*

Swamp. *Bromus ciliatus.*

Upright. *Bromus racemosus.*

Chess, Wild. *Bromus kalmii.*
Chicken Corn. *Andropogon sorghum cernuus.*
Chinese Sugar Corn. *Andropogon sorghum.*
Wheat. *Andropogon sorghum.*
Chocolate Corn. *Andropogon sorghum.*
Citronella. *Andropogon nardus.*
Close-flowered Drop-seed-grass. *Sporobolus compressus.*
Cluster-flowered Beard-grass. *Andropogon macrourus.*
Coast Couch-grass. *Zoysia pungens.*
Cock's-foot. *Panicum crus-galli.*
Rough. *Dactylis glomerata.*
Cockspur. *Cenchrus echinatus.*
Bur. *Cenchrus tribuloides.*
Colorado-grass. *Panicum texanum.*
Blue-stem. *Agropyron spicatum.*
Sand-grass. *Andropogon hallii.*
Comb-grass, Meadow. *Eragrostis pectinacea.*
Common Manna-grass. *Glyceria fluitans.*
Meadow-grass. *Poa trivialis.*
Sea-reed. *Ammophila arundinacea.*
Concho-grass. *Panicum fasciculatum; P. texanum.*
Cord-grass, Fresh-water. *Spartina cynosuroides.*
Corn-Beads. *Coix lachryma.*
Corn, Broom. *Andropogon sorghum* var.
Chicken. *Andropogon sorghum* var. *cernuus.*
Chocolate. *Andropogon sorghum* var.
Durra. *Andropogon sorghum* var. *vulgaris.*
Guinea. *Andropogon sorghum* var. *cernuus.*
Indian. *Zea mays.*
White Egyptian. *Andropogon sorghum* var. *cernuus.*
Cotton-grass. *Panicum leucophæum.*
Couch Brome. *Bromus inermis.*
-grass. *Agropyron repens.*
-grass, Coast. *Zoysia pungens.*
-grass, Indian. *Cynodon dactylon.*
Crab-grass. *Panicum sanguinale; Schedonnardus texanus; Eleusine indica.*
Slender. *Panicum filiforme.*
Sprouting. *Panicum proliferum.*
Texan. *Schedonnardus texanus.*
Creek-Sedge. *Spartina stricta.*
Creeping Beard-grass. *Oplismenus setarius.*
Bent-grass. *Agrostis stolonifera.*
Crab-grass. *Panicum serotinum.*
Meadow-grass. *Eragrostis reptans.*
Mesquite. *Hilaria cenchroides.*
Panic. *Panicum repens.*

Creeping Paspalum. *Paspalum repens.*

Poa. *Poa compressa.*

Sea Spear-grass. *Glyceria maritima.*

Soft-grass. *Holcus mollis.*

Spear-grass. *Poa compressa.*

Wheat-grass. *Agropyron repens.*

Crested Dog's-tail-grass. *Cynosurus cristatus.*

Crop-grass. *Eleusine indica.* (Crab-grass is probably a corruption of Crop-grass.)

Crowfoot-grass. *Eleusine indica; Dactyloctenium ægyptiacum.*

Cuba-grass. *Andropogon halepensis.*

Cuscus. *Andropogon squarrosus.*

Cut-grass. *Leersia oryzoides.*

European. *Leersia oryzoides.*

Rice. *Leersia oryzoides.*

Virginia. *Leersia virginica.*

Dagassa. *Eleusine coracana.*

Dakota Millet. *Setaria italica; Panicum miliaceum.*

Darnel. *Lolium temulentum.*

Bearded. *Lolium temulentum.*

Fescue. *Festuca loliacea.*

Deccan-grass. *Panicum frumentaceum.*

Deer-grass. *Epicampes rigens.*

Dennett-grass. *Elymus striatus.*

Desert-grass. Name applied to species of *Blepharidachne.*

Devil's-grass. *Agropyron repens.*

Devil's Darning-needles. *Stipa spartea.*

Knitting-needles. *Stipa spartea.*

Dew-grass. *Agrostis alba.*

Summer. *Agrostis vulgaris.*

Dhaman. *Pennisetum cenchroides.*

Ditch Millet. *Paspalum scrobiculatum.*

Doab, Doorba, Doorva. *Cynodon dactylon.*

Dog or Dog's-grass. *Agropyron repens.*

Dog's Bent. *Agrostis canina.*

Dog's-tail-grass. *Eleusine indica.*

Crested. *Cynosurus cristatus.*

Dog's-tooth-grass. *Cynodon dactylon; Eleusine indica.*

Downy Oat-grass. *Avena pubescens.*

Persoon. *Trisetum subspicatum* var. *molle.*

Triple-awn. *Aristida stricta.*

Drooping Reed-grass. *Cinna pendula.*

Drop-seed-grass. Generic name for species of *Sporobolus.* Also applied to species of *Muhlenbergia* (e. g., *Muhlenbergia mexicana*).

Late. *Sporobolus serotinus.*

Rush-like. *Sporobolus junceus.*

Duck-grass. *Poa serotina.*

Durfa or **Durfee-grass.** *Agropyron repens.*

Durra Corn. *Andropogon sorghum.*

Dutch-grass. *Agropyron repens; Eleusine indica.*

Dwarf Meadow-grass. *Poa annua.*

Early Bunch-grass. *Eatonia obtusata.*

Meadow-grass. *Poa annua.*

Mesquit. *Buchloë dactyloides.*

Spring-grass. *Eriochloa punctata.*

Wild Oat-grass. *Aira præcox.*

East Indian Millet. *Pennisetum spicatum.*

Eaton's-grass. *Eatonia pennsylvanica.*

Egyptian-grass. *Dactyloctenium ægyptiacum; Andropogon halepensis.*

Millet. *Pennisetum spicatum; Andropogon halepensis.*

English-grass. *Poa pratensis.*

Bent-grass. *Agrostis alba.*

Blue-grass. *Festuca elatior.*

Rye- or Ray-grass. *Lolium perenne.*

Esparto-grass. *Stipa tenacissima; Lygeum spartum.*

European Cut-grass. *Leersia oryzoides.*

Evergreen-grass. *Arrhenatherum elatius;* is more rarely applied to *Festuca elatior.*

Millet. *Andropogon halepensis.*

Everlasting-grass. *Eriochloa annulata; E. punctata.*

Fall Marsh-grass. *Spartina cynosuroides.*

Red-top. *Triodia cupræa* (*Tricuspis seslerioides*).

False Buffalo-grass. *Munroa squarrosa.*

Guinea-grass. *Andropogon halepensis.*

Mesquit. *Buchloë dactyloides.*

Oat-grass. *Arrhenatherum elatius.*

Red-top. *Poa serotina.*

Rice. *Leersia oryzoides.*

Fat-grass. *Melinis minutiflora.*

Feather-grass. Generic name for species of *Stipa;* applied especially to *Stipa pennata;* also *Leptochloa mucronata* and *Holcus lanatus.*

Bunch-grass. *Stipa viridula.*

Fescue-grass. Generic name for species of *Festuca.*

Darnel. *Festuca loliacea.*

Hard. *Festuca duriuscula.*

Meadow. *Festuca pratensis.*

Nodding. *Festuca nutans.*

Red. *Festuca rubra.*

Sheep's. *Festuca ovina.*

Small. *Festuca microstachya.*

Spiked. *Festuca loliacea.*

Tall. *Festuca elatior.*

Tall Meadow. *Festuca elatior.*

Western. *Festuca microstachya.*

Wild. *Uniola latifolia.*

Fibrous-rooted Wheat-grass. *Agropyron caninum.*

Fine Bent. *Agrostis vulgaris.*

Fine-top. *Agrostis vulgaris; A. canina; Sporobolus airoides.*

Salt-grass. *Sporobolus asperifolius; S. airoides.*

Finger-grass. *Panicum sanguinale.*

Hairy. *Panicum sanguinale.*

Seaside. *Chloris petræa.*

Finger-spiked Beard-grass. *Andropogon provincialis.*

Indian-grass. *Andropogon provincialis.*

Wood-grass. *Andropogon provincialis.*

Fin's-grass. *Agropyron repens.*

Fiorin. *Agrostis stolonifera; A. alba.*

Flat-stalked or **Flat-stemmed grass.** *Poa compressa.*

Blue-grass. *Poa compressa.*

Floating-grass. *Hydrochloa carolinensis.*

Foxtail. *Alopecurus geniculatus.*

Manna-grass. *Glyceria fluitans.*

Fly-away-grass. *Agrostis scabra.*

Fly-catch-grass. *Leersia lenticularis.*

Fog, Old. *Danthonia spicata.*

Fool-hay. *Panicum capillare; Agrostis scabra.*

Fowl Meadow-grass. *Glyceria nervata; Poa serotina; Calamagrostis canadensis.*

Fox-grass. *Spartina juncea.*

Foxtail. *Setaria glauca; Erianthus saccharoides; Chloris verticillata; Hordeum jubatum,* and species of *Alopecurus; Hordeum murinum* (in California).

Branching. *Trichloris verticillata.*

Bristly. *Setaria verticillata* and *S. germanica.*

Floating. *Alopecurus geniculatus.*

Green. *Setaria viridis.*

Large. *Setaria composita.*

Meadow. *Alopecurus pratensis.*

Slender. *Alopecurus agrestis.*

Wild Water. *Alopecurus aristulatus*

Wrinkled. *Setaria corrugata.*

Yellow. *Setaria glauca.*

French Rye-grass. *Arrhenatherum elatius.*

Fresh-water Cord-grass. *Spartina cynosuroides.*

Fringed Brome-grass. *Bromus ciliatus.*

Fundi or **Fundungi.** *Paspalum exile.*

Furze-top. *Agrostis vulgaris; A. canina.*

Gama-grass. *Tripsacum dactyloides.*

Geranium-grass. *Andropogon schænanthus.*

German Millet. *Setaria italica.*

Giant Rye-grass. *Elymus condensatus.*

Gietta or **Guyetta-grass.** *Hilaria rigida.*

Gilbert's Relief-grass. *Phalaris caroliniana.*

Ginger-grass. *Andropogon schœnanthus.*

Golden Millet. *Setaria italica* var.

Oat-grass. *Trisetum pratense.*

-top. *Lamarckia aurea.*

Goose-grass. *Eleusine indica; Glyceria maritima; Panicum texanum; Poa annua.*

Grama. Generic name for species of *Bouteloua.* Applied sometimes to *Muhlenbergia texana,* and to other grasses in Arizona and New Mexico.

Black. *Bouteloua oligostachya; Muhlenbergia pungens; Bouteloua hirsuta.*

Blue. *Bouteloua oligostachya.*

China. *Muhlenbergia pungens.*

Low. *Bouteloua polystachya.*

Tall. *Bouteloua hirsuta; B. racemosa.*

White. *Bouteloua oligostachya,* and a species of *Aristida.*

Woolly-jointed. *Bouteloua eriopoda.*

Grapevine Mesquit or **Grapevine-grass.** *Panicum obtusum.*

Grass of the Andes. *Arrhenatherum elatius.*

Great Bunch-grass. *Festuca scabrella.*

Millet. *Andropogon sorghum.*

Green Foxtail. *Setaria viridis.*

-grass. *Poa pratensis; P. trivialis.*

Pigeon-grass. *Setaria viridis.*

Valley-grass. *Andropogon halepensis.*

Guatemala-grass. *Euchlæna mexicana.*

Guinea Corn. *Andropogon sorghum cernuus.*

-grass. *Panicum jumentorum.* Erroneously applied to *Andropogon halepensis.*

-grass, Alabama. *Andropogon halepensis.*

-grass, False. *Andropogon halepensis.*

Gumbo-grass. *Agropyron spicatum.*

Guyetta or **Gietta-grass.** *Sporobolus airoides; Hilaria rigida; H. jamesii.*

Hair-grass. Generic name for species of *Deschampsia* (*Aira.*) Applied to *Deschampsia flexuosa, Agrostis scabra,* and *Muhlenbergia capillaris.*

Bunch. *Muhlenbergia trichopodes.*

Seaside. *Muhlenbergia capillaris.*

Tufted. *Deschampsia cæspitosa.*

Wood. *Deschampsia flexuosa.*

Hairy Finger-grass. *Panicum sanguinale.*

Hairy-flowered Paspalum. *Paspalum dilatatum.*

Muskit. *Bouteloua racemosa.*

Halfa. *Stipa tenacissima.*

Hard Fescue. *Festuca duriuscula.*

-grass. *Stenotaphrum americanum.*

Hare's-grass. *Aristida californica.*

Hare's Tail. *Lagurus ovatus.*

Hassock-grass. *Deschampsia cæspitosa.*

Hedgehog-grass. *Asprella hystrix* and *Cenchrus tribuloides.*

Herd's-grass. *Agrostis alba; A. vulgaris; Phleum pratense.*

Fibrous-rooted Wheat-grass. *Agropyron caninum.*

Fine Bent. *Agrostis vulgaris.*

Fine-top. *Agrostis vulgaris; A. canina; Sporobolus airoides.*

Salt-grass. *Sporobolus asperifolius; S. airoides.*

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Hairy. *Panicum sanguinale.*

Seaside. *Chloris petræa.*

Finger-spiked Beard-grass. *Andropogon provincialis.*

Indian-grass. *Andropogon provincialis.*

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Foxtail. *Alopecurus geniculatus.*

Manna-grass. *Glyceria fluitans.*

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Low. *Bouteloua polystachya.*

Tall. *Bouteloua hirsuta; B. racemosa.*

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Muskit. *Bouteloua racemosa.*

Halfa. *Stipa tenacissima.*

Hard Fescue. *Festuca duriuscula.*

-grass. *Stenotaphrum americanum.*

Hare's-grass. *Aristida californica.*

Hare's Tail. *Lagurus ovatus.*

Hassock-grass. *Deschampsia cæspitosa.*

Hedgehog-grass. *Asprella hystrix* and *Cenchrus tribuloides.*

Herd's-grass. *Agrostis alba; A. vulgaris; Phleum pratense.*

Hog Millet. *Panicum miliaceum.*

Holy-grass. *Hierochloë borealis.*

Horse Millet. *Pennisetum (Penicillaria) spicatum.*

Howell's-grass. *Calamagrostis howellii.*

Hungarian Blue-grass. *Holcus lanatus.*

Brome-grass. *Bromus inermis.*

-grass. *Setaria italica.*

Indian Corn. *Zea mays.*

Couch-grass. *Cynodon dactylon.*

-grass. *Andropogon nutans (Sorghum nutans); Andropogon nutans* var. *avenaceus;* and *A. scoparius.*

Finger-spiked. *Andropogon provincialis.*

Oat-like. *Andropogon nutans.*

Millet. *Oryzopsis cuspidata; Pennisetum spicatum; Andropogon sorghum; Setaria italica.*

Reed. *Cinna arundinacea.*

Rice. *Zizania aquatica.*

Wheat. *Panicum ciliatissimum.*

Italian Millet. *Setaria italica.*

Rye-grass. *Lolium italicum.*

Ivory Wheat. *Andropogon sorghum.*

Japanese Lawn-grass. *Zoysia pungens.*

Millet. *Panicum crus-galli; Pennisetum spicatum* and varieties of *Setaria italica* and *Panicum miliaceum.*

Wheat-grass. *Brachypodium japonicum.*

Japan Millet. *Pennisetum spicatum.*

Jerusalem Corn. *Andropogon sorghum* var.

Job's Tears. *Coix lachryma.*

Johnson-grass. *Andropogon halepensis.*

Joint-grass. *Paspalum distichum.*

June-grass. *Poa pratensis; Kœleria cristata; Danthonia spicata.*

Wild. *Kœleria cristata.*

Jungle Rice. *Panicum colonum.*

Kafir Corn. *Andropogon sorghum* variety.

Kangaroo-grass. *Anthistiria ciliata.*

Kangna. *Panicum flavidum.*

Kansas Millet. *Panicum crus-galli.*

Kentucky Blue-grass. *Poa pratensis.*

Koda. *Paspalum scrobiculatum.*

Khushus. *Andropogon squarrosus.*

Knot-grass. *Paspalum distichum.*

Knot-root-grass. *Muhlenbergia mexicana.*

Korakan. *Eleusine coracana.*

Large Cane. *Arundinaria gigantea.*

Crowfoot-grass. *Panicum crus-galli.*

Foxtail. *Setaria composita.*

Water-grass. *Paspalum dilatatum.*

White-grained Mountain Rice. *Oryzopsis asperifolia.*

Late Drop-seed-grass. *Sporobolus serotinus.*
Lawn-grass, Japanese. *Zoysia pungens.*
Mexican. *Opizia stolonifera.*
Velvet. *Holcus lanatus.*
Lemon-grass. *Ctenium carolinianum; Andropogon citratus.*
Little Blue-stem. *Andropogon scoparius.*
Crab-grass. *Panicum serotinum.*
Lizard-tail-grass. *Manisuris granularis.*
Long-awned Poverty-grass. *Aristida tuberculosa.*
Long-leafed Bent. *Calamovilfa longifolia.*
Louisiana-grass. *Paspalum platycaule.*
Love-grass. *Eragrostis amabilis.*
Low Grama. *Bouteloua polystachya.*
Spear-grass. *Poa annua.*
Lyme-grass. Generic name for species of *Elymus;* applied especially to *E virginicus.*
Canada. *Elymus canadensis.*
Slender Hairy. *Elymus striatus.*
Upright Sea. *Elymus arenarius.*
Siberian. *Elymus sibiricus.*
Virginian. *Elymus virginicus.*
Maiden Cane. *Panicum curtisii.*
Maize. *Zea mays.*
Mandua. *Eleusine coracana.*
Manitoba Millet. *Panicum miliaceum.*
Manna-grass. Generic name for species of *Glyceria;* applied in Germany to *Panicum sanguinale.*
Common. *Glyceria fluitans.*
Nerved. *Glyceria nervata.*
Pale. *Glyceria pallida.*
Many-flowered Millet-grass. *Oryzopsis multiflora.*
Marram. *Ammophila arundinacea.*
Marsh-grass. *Spartina cynosuroides; S. stricta.*
Fall. *Spartina cynosuroides.*
Rough. *Spartina stricta.*
Salt. *Spartina stricta; S. juncea.*
Marsh Bent. *Agrostis alba.*
Oat-grass. *Trisetum palustre.*
Mat-grass. *Ammophila arundinacea; Rottbœllia compressa.*
Maton. *Sporobolus wrightii.*
May-grass. *Poa annua.*
Meadow-grass, Alpine. *Poa laxa.*
Annual. *Poa annua.*
Common. *Poa trivialis.*
Creeping. *Eragrostis reptans.*
Creeping Sea. *Glyceria maritima.*
Dwarf. *Poa annua.*
Early. *Poa annua.*

Meadow-grass, Flat-stalked. *Poa compressa.*
Fowl. *Glyceria nervata; Poa serotina; Calamagrostis canadensis.*
Pungent. *Eragrostis major.*
Reed. *Glyceria aquatica.*
Rough. *Poa trivialis.*
Rough-stalked. *Poa trivialis.*
Short-stalked. *Eragrostis frankii.*
Slender. *Eragrostis pilosa.*
Smooth. *Poa pratensis.*
Smooth-stalked. *Poa pratensis.*
Strong-scented. *Eragrostis minor.*
Wavy. *Poa laxa.*
Wood. *Poa nemoralis.*

Meadow Cat's-tail-grass. *Phleum pratense.*
Comb-grass. *Eragrostis pectinacea.*
Fescue. *Festuca pratensis.*
Foxtail. *Alopecurus pratensis.*
Oat-grass. *Avena pratensis.*
Soft-grass. *Holcus lanatus.*
Soft-grass, Velvet. *Holcus lanatus.*
Spear-grass. *Glyceria nervata.*

Mean's-grass. *Andropogon halepensis.*

Melic-grass. *Melica mutica.*

Meskit-grass. *Bouteloua hirsuta; Buchloë dactyloides.*

Mesquit-grass. Applied generally to species of *Bouteloua* (e. g., *Bouteloua texana*), and to *Aristida purpurea.*
Bristly. *Bouteloua hirsuta.*
Early. *Buchloë dactyloides.*
False. *Buchloë dactyloides.*
Grape-vine. *Panicum obtusum.*
Running or **Creeping.** *Hilaria cenchroides.*
Velvet. *Holcus lanatus.*
Vine. *Panicum obtusum.*

Mexican Lawn-grass. *Opizia stolonifera.*
Whisk. *Epicampes macroura.*

Mezquit-grass. Same as Mesquit grass.

Millet, African. *Pennisetum spicatum.*
American. *Setaria italica.*
Arabian Evergreen. *Andropogon halepensis.*
Cat-tail. *Setaria italica; Pennisetum spicatum.*
Common. *Panicum miliaceum; Pennisetum spicatum; Milium effusum.*
East Indian. *Pennisetum spicatum.*
Egyptian. *Pennisetum spicatum; Andropogon sorghum.*
Evergreen. *Andropogon halepensis.*
German. *Setaria germanica.*
Golden. *Setaria italica* var.

Millet, Horse. *Pennisetum spicatum.*

Indian. *Oryzopsis membranacea; Andropogon sorghum; Pennisetum spicatum; Setaria italica.*

Japan. *Pennisetum spicatum.*

Many-flowered. *Oryzopsis multiflora.*

Morocco. *Andropogon halepensis.*

Pearl. *Pennisetum spicatum.*

Polish. *Panicum sanguinale.*

Russian. *Panicum miliaceum.*

Seaside. *Paspalum distichum.*

Shanna. *Panicum colonum.*

Sorghum. *Andropogon sorghum* var.

Sprouting. *Panicum proliferum.*

Millet-grass, Wild. *Milium effusum; Oryzopsis membranacea; Setaria viridis.*

Mission-grass. *Stenotaphrum americanum.*

Missouri Millet. *Setaria italica.*

Mitchell-grass. *Astrebla pectinata.*

Molasses-grass. *Melinis minutiflora.*

Montana Rye. *Triticum polonicum.*

Morocco Millet. *Andropogon halepensis.*

Mountain Oat-grass. *Danthonia compressa; D. unispicata.*

Poa. *Poa alpina.*

Red-top. *Agrostis exarata; A. canina.*

Rice. Generic name for species of *Oryzopsis.* *O. asperifolia.*

Black-fruited. *Oryzopsis melanocarpa.*

Large White-grained. *Oryzopsis asperifolia.*

Small. *Oryzopsis canadensis.*

Sedge. *Andropogon scoparius.*

Spear-grass. *Poa arida; P. alpina.*

Timothy. *Alopecurus occidentalis; Phleum alpinum.*

Munro-grass. *Panicum agrostoides.*

Muskit-grass. *Bouteloua racemosa; B. hirsuta; B. oligostachya.*

Naked Beard-grass. *Gymnopogon racemosus.*

Native Timothy. *Phleum alpinum.*

Needle-and-Thread. *Stipa comata.*

-grass. *Stipa comata.*

Nerved Manna-grass. *Glyceria nervata.*

Nimble Will. *Muhlenbergia diffusa.*

Nit-grass. *Gastridium australe.*

Nodding Fescue. *Festuca nutans.*

Northern Red-top. *Agrostis exarata.*

Oat-grass. *Arrhenatherum elatius.*

Oat-grass, Black. *Stipa avenacea.*

California. *Danthonia californica.*

Downy. *Avena pubescens.*

Early Wild. *Aira præcox.*

Oat-grass, False. *Arrhenatherum elatius.*
Golden. *Avena flavescens.*
Marsh. *Trisetum palustre.*
Meadow. *Avena pratensis.*
Mountain. *Danthonia compressa.*
Purple Wild. *Avena striata.*
Silky-flowered. *Danthonia sericea.*
Spiked Wild. *Danthonia spicata.*
Tall. *Arrhenatherum elatius.*
Tall Meadow. *Arrhenatherum elatius.*
Taller Wild. *Danthonia sericea.*
Tennessee. *Danthonia compressa.*
Wild. *Danthonia; Stipa viridula.*
Yellow. *Trisetum pratense.*
Oat-like Indian-grass. *Andropogon nutans.*
Sorghum. *Andropogon avenaceum.*
Oats. *Avena sativa.*
Australian. *Bromus unioloides.*
Sand. *Avena fatua.*
Seaside. *Uniola paniculata.*
Water. *Zizania aquatica.*
Wild. *Avena fatua; Uniola latifolia; Zizania miliacea; Calamagrostis nuttalliana.*
Old Fog. *Danthonia spicata.*
Witch-grass. *Panicum capillare.*
Orchard-grass. *Dactylis glomerata.*
Orcheston-grass. *Poa trivialis.*
Oregon Rice. *Andropogon sorghum.*
Pale Manna-grass. *Glyceria pallida.*
Pampas Rice. *Andropogon sorghum vulgaris.*
Panic-grass. *Panicum* species.
Bitter. *Panicum amarum.*
Bent-grass. *Panicum agrostoides.*
Para-grass. *Panicum molle.*
Parramatta-grass. *Sporobolus indicus.*
Pearl Millet. *Pennisetum spicatum.*
Perennial Rye-grass. *Lolium perenne.*
Pigeon-grass. *Setaria viridis.*
Green. *Setaria viridis.*
Pine Bunch-grass. *Festuca* sp.
Piñon-grass. *Festuca ovina* variety.
Plume-grass. *Erianthus ravennæ; E. saccharoides.*
Poison Rye-grass. *Lolium temulentum.*
Polish Millet. *Panicum sanguinale.*
Pony-grass. *Calamagrostis neglecta.*
Porcupine-grass. *Stipa spartea.*
Poverty-grass. *Aristida dichotoma; A. lanata; Danthonia spicata.*

Poverty-grass, Long-awned. *Aristida tuberculosa.*

Southern. *Sporobolus vaginæflorus.*

Woolly. *Aristida lanata.*

Prairie-grass. *Sporobolus asper; S. vaginæflorus; Kœleria cristata; Eatonia obtusata.*

Australian. *Bromus unioloides.*

Prairie Triple-awn. *Aristida oligantha.*

Prickle-grass. *Leersia oryzoides.*

Pungent Meadow-grass. *Eragrostis major.*

Purple Bearded-grass. *Aristida purpurea.*

Bent. *Calamovilfa brevipilis.*

-grass. *Pappophorum wrightii.*

Heads. *Triraphis mollis.*

Paspalum. *Paspalum boscianum; P. plicatulum.*

Sand-grass. *Triplasis purpurea.*

-top. *Triodia cuprœa* (*Tricuspis seslerioides*).

Wild-oat. *Avena striata.*

Wood-grass. *Andropogon scoparius.*

Quack-grass. *Agropyron spicatum; A. repens; Distichlis maritima.*

Quaking-grass. Generic name for species of *Briza.* *B. media.*

Tall. *Glyceria canadensis.*

Quick-grass. *Agropyron repens.*

Quitch-grass. *Agropyron repens.*

Quivering-grass. *Oryzopsis membranacea.*

Ragi Millet. *Eleusine coracana.*

Rancheria-grass. *Elymus arenarius.*

Randall-grass. *Festuca pratensis.*

Range-grass. *Panicum obtusum.*

Rat-tail-grass. *Rottbœllia* species.

Rattlesnake-grass. *Glyceria canadensis; Beckmannia eruœformis.*

Ray- or Rye-grass. *Lolium perenne.*

Red Fescue. *Festuca rubra.*

Millet. *Panicum sanguinale.*

Salt-grass. *Spartina juncea.*

Red-top. *Agrostis vulgaris; Calamagrostis canadensis.*

Fall. *Triodia cuprœa.*

False. *Poa serotina.*

Mountain. *Agrostis exarata; A. canina.*

Northern. *Agrostis exarata.*

Panic. *Panicum agrostoides.*

Tall. *Triodia cuprœa; Agrostis vulgaris.*

Wild. *Panicum virgatum.*

Reed. *Arundinaria tecta; Ammophila arundinacea; Zizania aquatica.*

Bent-grass. *Calamagrostis canadensis.*

Canadian Small. *Calamagrostis canadensis.*

Reed-grass. *Phragmites communis; Andropogon nutans.*

Drooping. *Cinna pendula.*

Salt. *Spartina polystachya.*

Reed-grass, Small. *Calamagrostis canadensis.*

Wood. *Cinna arundinacea.*

Reed, Canary-grass. *Phalaris arundinacea; P. caroliniana.*

Indian. *Cinna arundinacea.*

Meadow-grass. *Glyceria aquatica.*

Sea-sand. *Ammophila arundinacea.*

Sweet. *Cinna arundinacea.*

Relief-grass, Gilbert's. *Phalaris caroliniana.*

Rescue-grass. *Bromus unioloides.*

Rhode Island Bent. *A. canina; Agrostis vulgaris.*

Ribbon-grass. *Phalaris arundinacea.*

Rice. *Oryza sativa.*

Black-fruited Mountain. *Oryzopsis melanocarpa.*

Cut-grass. *Leersia oryzoides.*

False. *Leersia oryzoides.*

-grass. *Leersia oryzoides.*

Indian. *Zizania aquatica.*

Jungle. *Panicum colonum.*

Large White-grained Mountain. *Oryzopsis asperifolia.*

Mountain. Generic name for species of *Oryzopsis; O. asperifolia.*

Oregon. *Andropogon sorghum.*

Pampas. *Andropogon sorghum.*

Small Mountain. *Oryzopsis canadensis.*

Tuscarora. *Zizania aquatica.*

Water. *Zizania aquatica.*

Wild. *Zizania aquatica.*

River-grass. *Panicum texanum.*

Rocky Mountain Hair-grass. *Deschampsia cæspitosa* var.

Rolling Spinifex. *Spinifex hirsutus.*

Rough Bent-grass. *Agrostis scabra.*

Cock's-foot. *Dactylis glomerata.*

-leafed Bent-grass. *Agrostis asperifolia.*

Marsh-grass. *Spartina glabra.*

Meadow-grass. *Poa trivialis.*

Roughish Meadow-grass. *Poa trivialis.*

Rough-stalked Meadow-grass. *Poa trivialis.*

Running Mesquit. *Hilaria cenchroides.*

Rusa Oil-grass. *Andropogon schœnanthus.*

Rush-grass. Generic name for species of *Sporobolus.*

-like Drop-seed. *Sporobolus junceus.*

Salt-grass. *Spartina juncea.*

Russian Millet. *Panicum miliaceum.*

Rye. *Secale cereale.*

Montana. *Triticum polonicum.*

Rye-grass. *Elymus virginicus; Lolium perenne.*

English. *Lolium perenne.*

Rye-grass, French. *Arrhenatherum elatius.*
Giant. *Elymus condensatus.*
Italian. *Lolium italicum.*
Perennial. *Lolium perenne.*
Poison. *Lolium temulentum.*
Smooth. *Elymus virginicus.*
Western. *Elymus condensatus.*
Wild. *Elymus canadensis; E. condensatus; E. triticoides; E. virginicus.*
Saccato or Saccatone. *Sporobolus wrightii: Muhlenbergia distichophylla.*
St. Augustine-grass. *Stenotaphrum americanum.*
St. Mary's-grass. *Panicum jumentorum; Andropogon halepensis.*
Salem-grass. *Holcus lanatus.*
Salt-cedar. *Monanthochloë littoralis.*
-grass. *Sporobolus airoides; Distichlis maritima.*
Red. *Spartina juncea.*
Rush. *Spartina juncea.*
Marsh-grass. *Spartina stricta* and *S. juncea.*
Reed-grass. *Spartina polystachya.*
Sand-Bur. *Cenchrus tribuloides.*
-grass. *Triplasis purpurea: Oryzopsis membranacea: Distichlis maritima: Calamovilfa longifolia: Andropogon hallii; Calamagrostis canadensis.*
Colorado. *Andropogon hallii.*
Oats. *Avena fatua.*
Reed. *Ammophila arundinacea.*
Spur. *Cenchrus tribuloides.*
Satin-grass. *Muhlenbergia glomerata; M. mexicana.*
Bearded. *Muhlenbergia sylvatica.*
Heads. *Andropogon erianthoides.*
Schrader's-grass. *Bromus unioloides.*
Scutch-grass. *Cynodon dactylon; Agropyron repens.*
Sea Lyme-grass, Upright. *Elymus arenarius.*
Meadow-grass, Creeping. *Glyceria maritima.*
Reed, Common. *Ammophila arundinacea.*
Sea-sand Reed. *Ammophila arundinacea.*
Sea Spear-grass. *Glyceria maritima.*
Seaside Millet. *Paspalum distichum.*
Finger-grass. *Chloris petraea.*
Hair-grass. *Muhlenbergia capillaris.*
Oats. *Uniola paniculata.*
Sedge, Broom. *Andropogon virginicus.*
Creek. *Spartina stricta.*
-grass. *Andropogon virginicus.*
Seneca-grass. *Hierochloë borealis.*
Sennoc. *Lygeum spartum.*
Sesame-grass. *Tripsacum dactyloides.*
Shama Millet. *Panicum colonum.*

Shamalo-grass. *Panicum frumentaceum.*

Sheep's Fescue. *Festuca ovina.*

Shining Spike-grass. *Uniola nitida.*

Short-leafed Beard-grass. *Gymnopogon brevifolius.*

Short-stalked Meadow-grass. *Eragrostis frankii.*

Siberian Lyme-grass. *Elymus sibiricus.*

Side Oats. *Bouteloua racemosa.*

Silk-grass. *Agrostis scabra.*

Silky-flowered Oat-grass. *Danthonia sericea.*

Heads. *Andropogon bombycinus.*

Silver Beard-grass. *Andropogon argyræus; A. saccharoides.*

Tussock. *Poa cæspitosa* var.

Simpson's-grass. *Panicum curtisii.*

Six-weeks-grass. *Poa annua.* Name applied in the Southwest to any low, quick-growing annual grass.

Sleepy-grass. *Stipa viridula.*

Slender Cord-grass. *Spartina gracilis.*

Crab-grass. *Panicum filiforme.*

Fescue. *Festuca tenella; Festuca tenuifolia.*

Foxtail. *Alopecurus agrestis.*

Meadow-grass. *Eragrostis pilosa.*

Spike-grass. *Uniola gracilis.*

Tail-grass. *Schedonnardus texanus.*

Slough-grass. *Beckmannia erucæformis; Spartina cynosuroides.*

Small Cane. *Panicum divaricatum; Arundinaria tecta.*

Fescue. *Festuca microstachya.*

flowered White-grass. *Leersia virginica.*

Mountain Rice. *Oryzopsis canadensis.*

Reed-grass, Canadian. *Calamagrostis canadensis.*

Smaller Blue-grass. *Poa compressa.*

Smooth Brome-grass. *Bromus racemosus; B. inermis.*

Chloris. *Chloris glauca.*

Marsh-grass. *Spartina alterniflora.*

Meadow-grass. *Poa pratensis.*

Paspalum. *Paspalum lave.*

Rye-grass. *Elymus virginicus.*

-stalked Meadow-grass. *Poa pratensis.*

Smut-grass. *Sporobolus indicus.*

Snow-grass. *Danthonia flavescens.*

Soft Brome-grass. *Bromus mollis.*

Chess. *Bromus mollis.*

-grass, Creeping. *Holcus mollis.*

Meadow. *Holcus lanatus.*

Woolly. *Holcus lanatus.*

Sea Lyme-grass. *Elymus mollis.*

Sorghum Millet. *Andropogon sorghum* var.

Southern Bent-grass. *Agrostis elata.*

Canary-grass. *Phalaris caroliniana.*

Eragrostis. *Eragrostis purshii.*

Poverty-grass. *Sporobolus vaginæflorus.*

Spear-grass. *Eragrostis purshii; Poa flexuosa.*

Spanish-grass. *Panicum molle.*

Spear-grass. *Poa annua; P. pratensis; Triodia trinerviglumis; Stipa spartea.*

Branching. *Eragrostis tenuis.*

Bunch. *Poa andina.*

Creeping. *Poa compressa.*

Creeping Sea. *Glyceria maritima.*

Low. *Poa annua.*

Meadow. *Glyceria nervata.*

Mountain. *Poa arida.*

Sea. *Glyceria maritima.*

Southern. *Poa flexuosa; Eragrostis purshii.*

White. *Glyceria aquatica.*

Wood. *Poa alsodes.*

Spider Bent-grass. *Agrostis arachnoides.*

Spike-grass. Generic name for species of *Uniola.* *Uniola paniculata; Diplachne fascicularis; Distichlis maritima.*

Shining. *Uniola nitida.*

Slender. *Uniola gracilis.*

Spiked Fescue. *Festuca loliacea.*

Wild Oat-grass. *Danthonia spicata.*

Spring-grass, Sweet-scented. *Anthoxanthum odoratum.*

Rolling-grass. *Spinifex hirsutus.*

Sprouting Crab-grass. *Panicum proliferum.*

Millet *Panicum proliferum.*

Squirrel-grass. *Hordeum murinum.*

Squirrel-tail-grass. *Hordeum jubatum; H. pratense.*

Stewart's Canary-grass. *Phalaris caroliniana.*

Stink-grass. *Eragrostis minor; E. major.*

Strong-scented Meadow-grass. *Eragrostis minor.*

Sporobolus. *Sporobolus heterolepis.*

Suffolk-grass. *Poa annua.*

Sugar Cane. *Andropogon sorghum.*

African. *Andropogon sorghum.*

Chinese. *Andropogon sorghum.*

Sugar-grass. *Pollinia fulva.*

Summer Dew-grass. *Agrostis vulgaris.*

Swamp Chess. *Bromus ciliatus.*

Millet. *Isachne australis.*

Wire-grass. *Poa serotina.*

Sweet-grass. *Hierochloë borealis.*

-scented-grass. *Anthoxanthum odoratum.*

Sweet-scented Spring-grass. *Anthoxanthum odoratum.*

Vernal-grass. *Anthoxanthum odoratum.*

Reed. *Cinna arundinacea.*

Sorghum. *Sorghum saccharatum.*

Vernal-grass. *Anthoxanthum odoratum.*

Switch-grass. *Panicum virgatum.*

Syrian-grass. *Andropogon halepensis.*

Tail-grass, Slender. *Schedonnardus texanus.*

Tall Fescue. *Festuca elatior.*

Grama. *Boutelona hirsuta.*

Oat-grass. *Arrhenatherum elatius; Anthistiria arenacea.*

Quaking-grass *Glyceria canadensis.*

Red-top. *Triodia cupræa; Agrostis vulgaris.*

Sheep's Fescue. *Festuca duriuscula.*

Smooth, Panic-grass. *Panicum virgatum.*

Thin-grass. *Agrostis elata.*

Taller Wild-grass. *Danthonia sericea.*

Tame Timothy. *Phleum pratense.*

Tear-grass. *Coix lachryma.*

Teff. *Eragrostis abyssinica.*

Tennessee Oat-grass. *Danthonia compressa.*

Teosinte. *Euchlæna mexicana.*

Terrell-grass. *Elymus virginicus* and *E. canadensis.*

Texan Blue-grass. *Poa arachnifera.*

Crab-grass. *Schedonnardus texanus.*

Texas Millet. *Panicum texanum.*

Thatch-grass. *Spartina cynosuroides; S. stricta.*

Thin-grass. *Agrostis perennans.*

Tall. *Agrostis elata.*

Tickle-grass. *Agrostis scabra.*

Tiger-grass. *Thysanolæna acarifera.*

Timothy. *Phleum pratense.*

Californian. *Phalaris angusta.*

Mountain. *Alopecurus occidentalis.*

Native. *Phleum alpinum.*

Tame. *Phleum pratense.*

White. *Holcus lanatus.*

Wild. *Muhlenbergia glomerata; Beckmannia cruciformis; Setaria viridis.*

Toothache-grass. *Ctenium americanum.*

Triple-awned-grass. Generic name for species of *Aristida.*

Tuft-grass, White. *Triodia acuminata.*

Tufted Hair-grass. *Deschampsia cæspitosa.*

Turkey-foot-grass. *Andropogon hallii; A. provincialis.*

Turkish Millet. *Andropogon sorghum.*

Tuscarora Rice. *Zizania aquatica* and *Z. miliacea.*

Tussock-grass. *Poa flabellata; Sporobolus indicus.*

Twin-grass. *Diarrhena americana.*
Twisted Beard-grass. *Andropogon contortus.*
Twitch-grass. *Agropyron repens.*
Upright Chess. *Bromus racemosus.*
Sea-lyme-grass. *Elymus arenarius.*
Usar-grass. *Sporobolus orientalis.*
Valley-grass, Green. *Andropogon halepensis.*
Vanilla-grass. *Hierochloë borealis.*
Various-leafed Fescue. *Festuca heterophylla.*
Velvet-grass. *Holcus lanatus.*
Lawn-grass. *Holcus lanatus.*
Meadow-grass, Soft. *Holcus lanatus.*
Mesquit. *Holcus lanatus.*
Vernal-grass. *Anthoxanthum odoratum.*
Sweet. *Anthoxanthum odoratum.*
Vetivert. *Andropogon squarrosus.*
Vine Mesquit. *Panicum obtusum.*
Virginia Beard-grass. *Andropogon virginicus.*
Cut-grass. *Leersia virginica.*
Lyme-grass. *Elymus virginicus.*
Vitivert. *Andropogon squarrosus.*
Wallaby-grass. *Danthonia semiannularis.*
Water Couch-grass. *Paspalum distichum.*
Water Foxtail *Alopecurus geniculatus.*
Wild. *Alopecurus aristulatus.*
Water-grass. *Panicum crus-galli.*
Meadow-grass. *Glyceria aquatica.*
Oats. *Zizania aquatica; Uniola paniculata.*
Rice. *Zizania aquatica.*
Wavy Meadow-grass. *Poa laxa.*
Western Beard-grass. *Aristida purpurea.*
Brome-grass. *Bromus pumpellianus.*
Fescue. *Festuca microstachya.*
June-grass. *Koeleria cristata.*
Rye-grass. *Elymus condensatus.*
Wheat. *Triticum sativum.*
-grass. Generic name for species of *Agropyron; A. spicatum.*
-grass, Awned. *Agropyron caninum.*
Bearded. *Agropyron caninum.*
Creeping. *Agropyron repens.*
Fibrous-rooted. *Agropyron caninum.*
Japanese. *Brachypodium japonicum.*
Wiry. *Agropyron divergens.*
Chinese. *Andropogon sorghum.*
Ivory. *Andropogon sorghum vulgaris.*
Wild. *Elymus triticoides.*

Wheat, Wild-goose. *Triticum polonicum.*

White Alfillaria *Munroa squarrosa.*

Bent. *Agrostis alba; Andropogon scoparius.*

Egyptian Corn. *Andropogon sorghum cernuus.*

Grama. *Bouteloua oligostachya.*

-grass. *Leersia oryzoides; L. virginica.*

Small-flowered. *Leersia virginica.*

Rush. *Spartina juncea.*

Spear-grass. *Glyceria aquatica.*

Timothy. *Holcus lanatus.*

Top. *Danthonia spicata; Agrostis alba.*

Tuft-grass. *Triodia acuminata.*

Yorkshire. *Holcus lanatus.*

Wild Barley. *Hordeum pratense.*

Chess. *Bromus kalmii.*

Fescue-grass. *Uniola latifolia.*

-goose Wheat. *Triticum polonicum.*

June-grass. *Kœleria cristata.*

Millet-grass. *Milium effusum; Oryzopsis membranacea; Setaria viridis.*

Oat-grass, Purple. *Avena striata.*

Oat-grass or **Oat-grass.** Species of *Danthonia; Andropogon nutans; Arrhenatherum elatius; Stipa viridula.*

Oats. *Avena fatua; Uniola latifola; Zizania latifolia; Calamagrostis nuttalliana.*

Quack-grass. *Agropyron spicatum.*

Red-top. *Panicum virgatum.*

Rice. *Panicum colonum; Zizania aquatica*

Rye. *Elymus virginicus; E. triticoides; E. condensatus.*

Timothy. *Muhlenbergia glomerata; Setaria viridis; Beckmannia erucæformis.*

Water Foxtail. *Alopecurus aristulatus.*

Wheat. *Elymus triticoides.*

Willard's Brome-grass. *Bromus secalinus.*

Wire-grass. *Muhlenbergia diffusa; Poa compressa; Sporobolus junceus; Aristida stricta; Cynodon dactylon; Eleusine indica; Andropogon scoparius; Sporobolus heterolepis; Schedonnardus texanus.* Also applied to *Juncus* species.

Swamp. *Poa serotina.*

Bunch-grass. *Agropyron divergens.*

Wiry Wheat-grass. *Agropyron divergens.*

Witch-grass. *Agropyron repens.*

Old. *Panicum capillare.*

Wood-grass. *Sorghum nutans; Muhlenbergia mexicana.*

Finger-spiked. *Andropogon provincialis.*

Purple. *Andropogon scoparius.*

Wood Hair-grass. *Deschampsia flexuosa.*

Meadow-grass. *Poa memoralis.*

Reed-grass. *Cinna arundinacea.*

Spear-grass. *Poa alsodes.*

Woolly Beard-grass. *Erianthus saccharoides.*
Bent-grass. *Calamovilfa longifolia.*
-jointed Grama. *Bouteloua eriopoda.*
Poverty-grass. *Aristida lanata.*
Soft-grass. *Holcus lanatus.*
Triple-awn. *Aristida lanata.*
Yard-grass. *Eleusine indica.*
Yellow Foxtail. *Setaria glauca.*
Oat-grass. *Trisetum flavescens.*
Tussock. *Danthonia flavescens.*
Yerba de Para. *Panicum molle.*
Yorkshire Fog. *Holcus lanatus.*
White. *Holcus lanatus.*
Zacate de liebre. *Aristida californica.*
grass. *Sporobolus wrightii.*
Zacatone. *Sporobolus wrightii.*

BULLETIN No. 4.

U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF AGROSTOLOGY.

[Grass and Forage Plant Investigations.]

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ON

AMERICAN GRASSES.

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By F. LAMSON-SCRIBNER.

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V. NATIVE AND INTRODUCED SPECIES OF THE GENERA HORDEUM AND AGROPYRON.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF AGROSTOLOGY,
Washington, D. C., November 12, 1896.

SIR: I have the honor to transmit herewith and to recommend for publication as a bulletin of this division several technical papers on grasses which together may be entitled Studies on American Grasses. Enumerations of grasses of little explored regions, descriptions of new or little known genera and species, with a revision of the North American species of *Hordeum* and *Agropyron*, are included in these studies. Also a report upon certain Panicums in the Berlin Herbarium, by Mr. Theo. Holm, who was authorized by the Secretary to make the necessary examinations when in Europe in 1894.

Respectfully,

F. LAMSON-SCRIBNER,
Agrostologist.

Hon. CHAS. W. DABNEY, Jr.,
Assistant Secretary.

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STUDIES ON AMERICAN GRASSES.

I. THE GENUS IXOPHORUS.

By F. Lamson-Scribner.

Thirty-four years ago Schlechtendal, in a paper on *Setaria* Beauv., published in the thirty-first volume of Linnæa what he stated might at pleasure be regarded a section of *Panicum* or a distinct genus, naming it *Ixophorus*. This genus (or section) was established upon a grass collected by Schiede in December, 1834, at Atlacomulco, Mexico, and the *Urochloa uniseta* of Presl (Reliq. Haenk., 319, 1830), of which he only had a fragmentary specimen. Little was known of these grasses by other European botanists, and Bentham, who had never seen them, referred *Ixophorus* to *Setaria*, and in this he was followed by Hackel. The grasses placed in *Ixophorus* by Schlechtendal were apparently overlooked by collectors for many years, no specimens having been found until 1886, when Dr. E. Palmer collected what is evidently Presl's *Urochloa uniseta*, at Tequila, in the State of Jalisco (Palmer, No. 372), and three years later another species was discovered by Mr. C. G. Pringle in the valley of the Rio Grande de Santiago (No. 2423, Pringle, 1889). The same form as that collected by Pringle was, in 1891, collected by Dr. Palmer at Colima (No. 1256). Through the kindness of Dr. Trelease, I have been enabled to examine a typical specimen of Presl's species contained in the Bernhardi collection in the herbarium of the Missouri Botanical Garden. The specimens collected by Palmer in 1886 are identical with *Urochloa uniseta* Presl, and a study of the material now in hand has led me to believe that the special characters which these grasses present are of generic value, and that *Ixophorus* is a well-established genus.

A REVISION OF THE SPECIES.

Ixophorus Schlecht. Linnæa, XXXI, 420 (1861 and 1862). Spikelets with one terminal hermaphrodite or female flower, with a larger male one below it, very short pedicellate, imbricate and uniseriate along the branches of a simple panicle, the pedicels, as well as the main axis and primary branches, produced beyond the spikelets into slender smooth and viscid awn-like bristles, which equal or exceed the spikelets in length. Glumes, 4, the first very short and 3-nerved, the second a little shorter than the third and many-nerved, the third 5-nerved and much exceeding the punctate-scabrous, 5-nerved, fertile glume, which is flattened and bisulcate on the back, with a distinct hippocrateriform scar near

the base, and mucronate or short awn-pointed. Palea of the male floret equaling the glume, at first hyaline, the margins becoming broadly alate and cartilaginous in fruit. Stamens 3. Styles long, distinct; stigmas aspergilliform. Grain oblong obtuse, compressed, free within the fruiting glume and palea. Rather broad-leafed annual (or perennial?) branching grasses with a simple paniculate inflorescence of unilateral racemes.

Allied to *Panicum* Sect. *Ptycophyllum*, but distinguished by having the awn-like continuations of the branches smooth and viscid, by the broadly winged palea of the male flower, and by the comparatively short and mucronate-pointed fourth glume, which is flattened on the back and longitudinally bisulcate. The smooth bristles, the winged palea of the third glume, combined with the characters presented by the fourth glume and the inflorescence, are deemed sufficient for the establishment of the genus. Neither Bentham nor Hackel had seen species of *Ixophorus* when they referred it to *Setaria* (see B. & H. Gen., Pl. III, p. 1105; Hackel, True Grasses, p. 79), and Schlechtendal made no note of the wing-like development of the palea of the third glume in fruit.

Species, 2 or 3; Mexico.

Ixophorus unisetus (Presl) Schlecht. (Plate I). An erect branching grass, with compressed culms 2 to 3 feet high, compressed sheaths, and numerous alternate racemes arranged on a continuous axis, forming terminal panicles 3 to 10 inches long. Culms smooth, alternately sulcate between the nodes; sheaths shorter than the internodes, rather loose, with scarious margins above; ligule a line long, membranous; leaf blades 8 to 10 inches long. 5–18 lines wide, scabrous on both sides at least toward the apex, and along the margins. Racemes 2½ to 4 inches long, the axis somewhat 3-angled, flower-bearing to near the base, scabrous, the apex excurrent into a slender, smooth, somewhat viscid awn, as are the very short scabrous pedicels of the spikelets. Spikelets about two lines long, ovate-lanceolate, subacute; the first glume broadly ovate, acute, 3 nerved, less than half a line long; second glume broadly lanceolate or ovate, acute 9- to 11-nerved, one-fifth shorter than or nearly equaling the spikelet; third glume lanceolate acute, 5-nerved, 2 lines long, inclosing a staminate flower; fourth glume chartaceous, minutely punctate-scabrous, 3-nerved, scabrous at the tip, and short mucronate-pointed; palea of the third glume equaling it in length, at first thin-membranous, the margins becoming broadly alate and cartilaginous in fruit; palea of the fourth glume equaling it in length, and of similar texture, rounded, obtuse at the apex.—Schlecht. in Linnæa 31, p. 421 (1861–62); *Urochloa uniseta* Presl Reliq. Haenk., 319 (1830); *Panicum palmeri* Vasey in Contr. U. S. Natl. Herb., 1, No. 8, 281; *Ixophorus schiedeana* Schlecht. (?). No. 372 E. Palmer (1886).

Schlechtendal, in his description of *Ixophorus schiedeana*, calls it a tall panic grass about 3 feet high, glabrous, except the axis of the inflorescence, with linear acuminate leaves and crowded racemes arranged along the continuous axis. He says of his plant that it is more robust than Presl's, but they agree in the structure of the spikelets, excepting that the relation of the glumes to each other is a little different. While I am not prepared to assert positively that Schlechtendal's species (*I. schiedeana*) is identical with *I. unisetus*, I believe them to be the same. Certainly from the dimensions given, it must be distinct from the following:

Ixophorus pringlei Scribn., n. n. (*Panicum schiedeanum* Beal, not Trin.). (Plate II.) Culms 6 to 18 inches high, much branched below; nodes smooth, the lower more or less geniculate and sometimes rooting. Leaves 2 to 8 inches long, 2 to 5 lines wide, acute, scabrous on the margins, otherwise smooth. Panicle 1½ to 4 inches long; racemes 3 to 15, one-half to 2½ inches long, erect or ascending, rarely horizontal, pubescent at the base, scabrous along the angles, bristles flexuose, 3 to 4 lines long, viscid. Spikelets subsessile, about 2 lines long, first and second glumes obtuse. Otherwise as in *I. unisetus*. Valley of the Rio Grande de Santiago, State of Jalisco, Mexico. No. 2047 (1888) and 2423 (1889) Pringle. In these

specimens the panicle bears 2 to 6 racemes, which are from one-half to 1 inch long.

Var. **minor** var. nov. Slender, much branched, 6 to 12 inches high, leaves 1 to 3 inches long, 2 to 5 lines wide, bristles about as long as the spikelets, which are 1½ to 1¾ lines long. Colima, Mexico, No. 1256 E. Palmer, 1891.

II. A LIST OF THE GRASSES COLLECTED BY DR. E. PALMER IN THE VICINITY OF ACAPULCO, MEXICO, 1894–95.

By F. LAMSON-SCRIBNER.

The statements relative to the habitat, distribution, economic value, etc., in the following list are from Dr. Palmer's notes.

Paspalum platycaule Poir. (*Paspalum compressum* Nees). Found in thick masses around a spring in the higher mountains. The upright stems often 2 feet high, with leaves 7 to 9 inches long. February, 1895 (420).

Panicum paspaloides Pers. In thickets along river bottoms. December, 1894 (289).

Panicum sanguinale L. One specimen only, found in a garden, where the soil was moist. March, 1895 (549). From characters this is *Panicum inæquale* Fourn.

Panicum sanguinale L. var. **breviglume** Trin. forma *distans* Doell. Found among weeds in a dried-up river bed. February, 1895 (446).

Panicum sanguinale L. var. **longiglume** Doell. A common grass in ravines, often covering the stony surfaces. November, 1895 (112).

Panicum insulare Meyer (*Panicum leucopharum* HBK., *Andropogon insulare* L.). Among thorny bushes in river bottoms. December, 1894 (288).

Panicum brevifolium L. In a shady spot near a water hole. December, 1894 (287).

Panicum divaricatum L. A cane-like grass along river banks in the dense underbrush. November, 1894 (114).

Panicum compactum Sw. In similar situations with the last. November, 1894 (115). This is the same as 283 Liebmann.

Oplismenus cristatus Presl (*O. humboldtianus* var. *genuinus* Fourn., excl. syn.). Found in large masses on river bottoms in the thick, shady woods. October, 1894 (35). Brandegee 22 (1890); Palmer 1258 (1891); Fendler 363 (1850). This species has been confused with *O. humboldtianus* Nees, from which it is distinguished by the somewhat longer and more densely pilose empty glumes, which are deeply 2-lobed at the apex; the third glume has a dense ring or crown of stiff white hairs on the back just below the middle; the flowering glume is shorter than the first empty one. *O. humboldtianus* is represented in the National Herbarium by No. 1363 Turckenheim and No. 3120 A. Conduz (Herb. Inst. Costa Rica).

Cenchrus tribuloides L. Common on sandy beaches. December, 1894 (290). This is a low diffusely branching form with only a few heads on each stalk. It is the same as a specimen in the National Herbarium, collected near Rio Janeiro, by the Wilkes expedition.

Cenchrus multiflorus Presl. This grass, which grows to the height of 2 to 4 feet, and is eaten when young by cattle, occurs in depressions among the rocks from near the water's edge to the summit of the slopes facing the sea. November, 1894 (75),=Liebmann 341, referred to by Fournier.

Pennisetum purpurascens HBK. Growing in clumps 5 to 6 feet high, among the oaks on the higher mountain slopes. February, 1895 (433).

Anthephora elegans Schreb. Found in masses in shaded rocky ravines. October, 1894 (38). A small decumbent form rooting at the lower joints. The short (1 to 3 inches long) leaves and sheaths pilose or villous.

FOURNIERA Scribn., gen. nov. Tribe *Zoysieæ*. Plants dioecious. Spikelets dissimilar, solitary and sessile at the alternate notches of a continuous flexuose

rachis, readily falling off at maturity from the small, cushion-like barbate pedicel. Rachis alternately striate and sulcate. Staminate spikelets 2-flowered, the first floret sessile, the second raised on a short naked stipe or joint of the rachilla; rachilla not prolonged beyond the second floret. Outer empty glumes 3; 2 narrowly oblong, obtuse, 1-nerved; 1 larger, oblong, and obtuse; flowering glumes 3-nerved, the second 3-cleft, the divisions awn-like. Stamens, 3. Pistillate spikelets 1-flowered, with a 3-awned prolongation of the rachilla above the flower; outer empty glumes 3, equal, cuneate, broadest above, narrowed below into a short and rather densely pilose, pedicel-like base or claw; 2 broadly truncate and unequal, rounded at the apex, one of which is 2- to 3-nerved, the other 3- to 5-nerved; the third glume, occupying the position of a second empty glume, is a little narrower than the others, 1-nerved, and somewhat 3-lobed at the broad apex; flowering glume raised upon a short stipe or joint of the rachilla, 3-nerved, 3-cleft at the apex, the middle division longest and sometimes 2-toothed, the mid-nerve projecting between the teeth; styles distinct; stigmas plumose. A delicate, much-branched, creeping perennial, with simple erect spikes, the rachis projecting beyond the uppermost spikelet into a short, 2-cleft prolongation.

Species, 1; Mexico.

Fourniera mexicana, sp. nov. (Figs. 1, 2, 3.) Extensively creeping, sending up tufted branches 2 inches to 1 foot high. Sheaths loose, striate, smooth, usually much shorter than the leaves; ligule very short, ciliate, leaves one-half to 3 inches long, a line wide or less, very minutely scabrous on the nerves beneath and smooth or sparingly pilose above. Spikes terminal and axillary, often 3 or 4 naked flowering branches from the uppermost or terminal leaf-sheath, as in *Cathestecum*, the slender spikes bearing from 3 to 15 spikelets. Staminate spikelets 2 to 2½ lines long, two of the outer empty glumes about one-half line long, occupying the position of the first glume, that is, standing at the back of the first floral glume; the third glume, occupying the position of the second glume, broader, and a line long; first flowering glume 1½ lines long, thin membranous, smooth, rounded on the back, apex entire or indistinctly 3-toothed; palea longer than the glume, strongly 2-nerved, with broad infolded margins; second flowering glume nearly 2 lines long, including the awn-like extension of the mid-nerve, smooth; palea about as long as the glume. Pistillate spikelets about 2 lines long exclusive of the awns; outer glumes 1 to 1½ lines long, scabrous on the back, the narrow pedicel-like base of each densely pilose; flowering glume 1½ lines long, 3-cleft at the apex, the middle division longest, and sometimes 2-toothed, the mid-nerve projecting between the teeth; palea about as long as the glume; rachilla and flowering glume very smooth, the short division of the latter

FIG. 1.—*Fourniera mexicana*, male plant: *a*, spikelet; *b*, second floret; *c*, *d*, *e*, the three outer glumes (*e* corresponds to *e* in fig. 2); *g*, the floral glume of the same; *h*, stamens. The details are all drawn upon the same scale.

minutely scabrous, the awns which terminate the prolongation of the rachilla 3 to 4 lines long, somewhat dilated below, and softly ciliate along the margins, scabrous above. Found by Dr. Palmer in a deep cut in the mountains near Acapulco, Mexico, growing in loose, gravelly soil, October, 1894. "A fine grass, which is eaten with avidity by sheep and goats" (Nos. 41 and 43). The three outer glumes appear to originate upon the same plane, forming a whorl (see fig. 3). The two occupying the position of a first glume may represent a single glume divided to its base, or one of them may represent a scale-like prolongation of the partial axis supporting the spikelet, or it may even stand for a second spikelet of a group of two.

Arundinella martinicensis Trin. Growing in large bunches in sags of the higher mountains. February, 1895 (434). Culms 5 to 6 feet high, leafy below, naked above, smooth; sheaths longer than the internodes, tumid at the base, and very densely pubescent toward the apex; leaves 10 to 18 inches long, 5 to 8 lines wide when dried, papillate-pilose on the upper surface; ligule very short, membranous; panicle 6 to 12 inches long, densely flowered, the numerous branches erect; spikelets straw-colored, about 2½ lines long; perfect floret 1 line long; callus obtuse, bearded on the sides; awn 3½ lines long, slender, twisted below, geniculate and divergent above.

Aristida jorullensis Kth. (*Streptachne pilosa* HBK., *Ortachne pilosa* Nees). Rabbit grass. Eaten when young, or when better feed is scarce. Low bottom lands; also in the mountains, and common along roadsides. October, 1894 (36).

Sporobolus domingensis Kth. Found on a dry rocky slope overlooking the ocean. Eaten when young by all kinds of stock. November, 1894 (74.)

Eleusine indica Gaertn. On low bottom lands. November, 1894 (120).

Dactyloctenium ægyptium Willd. Low bottom lands. November, 1894 (121).

Bouteloua repens (HBK.). Found on the highest mountains and down their stony slopes to the water's edge. Eaten by all grass-eating animals. November, 1894 (113).

Opizia stolonifera Presl. (Fig. 4). One of the most important grasses of Mexico, growing close to the ground, forming a thick turf over all exposed surfaces, even over the cobble-paved streets. It is difficult to find seeds or good specimens, owing to the

FIG. 2.—*Fourniera mexicana*, female plant: *a*, terminal portion of rachis with two spikelets: *b*, a spikelet; *c*, *d*, *e*, outer glumes (*e* may represent a glume-like continuation of the secondary axis supporting the spikelet, or it may represent a second spikelet of a cluster of two); *f*, flowering glume raised upon a short joint of the rachilla (stipe); *g*, palea. At the left of *a* is a 3-awned prolongation of the rachilla. The pistil is shown in the upper left-hand corner.

constant nibbling of domestic animals. The staminate and pistillate plants are sometimes separated in large patches, or they may grow closely intermingled. This grass is used in the public squares with good effect, as the regular watering keeps it fresh and green, and but little cutting is necessary.

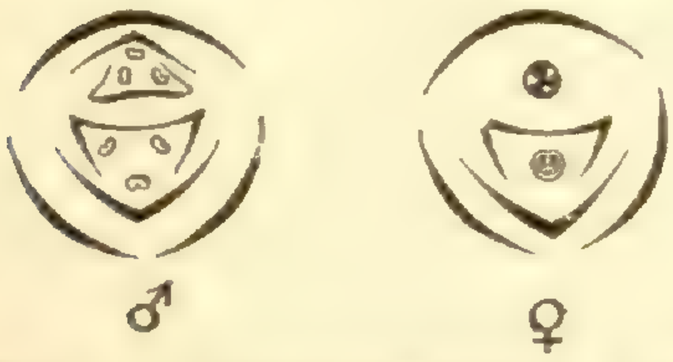

FIG. 3.—*Fourniera mexicana*. Diagram of male and female spikelets.

The generic characters for *Opizia* given by Presl (Reliq. Haenk., **1**: 293) are very imperfect, and are drawn apparently from the female plant, which alone he figures (Pl. 41, f. 1). Fournier revised the generic characters of this grass (Bull. Soc. Roy. Bot. Belg., XV, 471), but failed to understand the structure of the female spikelets, overlooking the minute first glume and thus mistaking the second glume for the first, the flowering glume for the second, and the palea for the flowering glume. Bentham, who had never seen *Opizia*, drew up the characters for the "Genera Plantarum" from those published by Fournier, and they were reproduced by Hackel without change. Baillon (Hist. de Plant., CXVIII, Graminées, 271) first correctly describes the female spikelets and caryopsis. The figures here presented were drawn from Dr. Palmer's specimens, and are designed to show the true structure of the female spikelets, including the minute first glume, which is scarcely longer than the hairs at the base and which has so long been overlooked. It may be said that the length of the awns varies a good deal, as do the lobes or divisions of the flowering glume. The stigmatic hairs are remarkably long and lax. The female spikelets are disposed in short, terminal spikes, while the staminate spikelets are imbricated in unilateral racemes. very closely resembling those of *Bulbilis* (*Buchloë*). The rachilla supporting the triaristate rudimentary floret in the pistillate spikelets is adnate to the palea for nearly its entire length. (Fig. 4.)

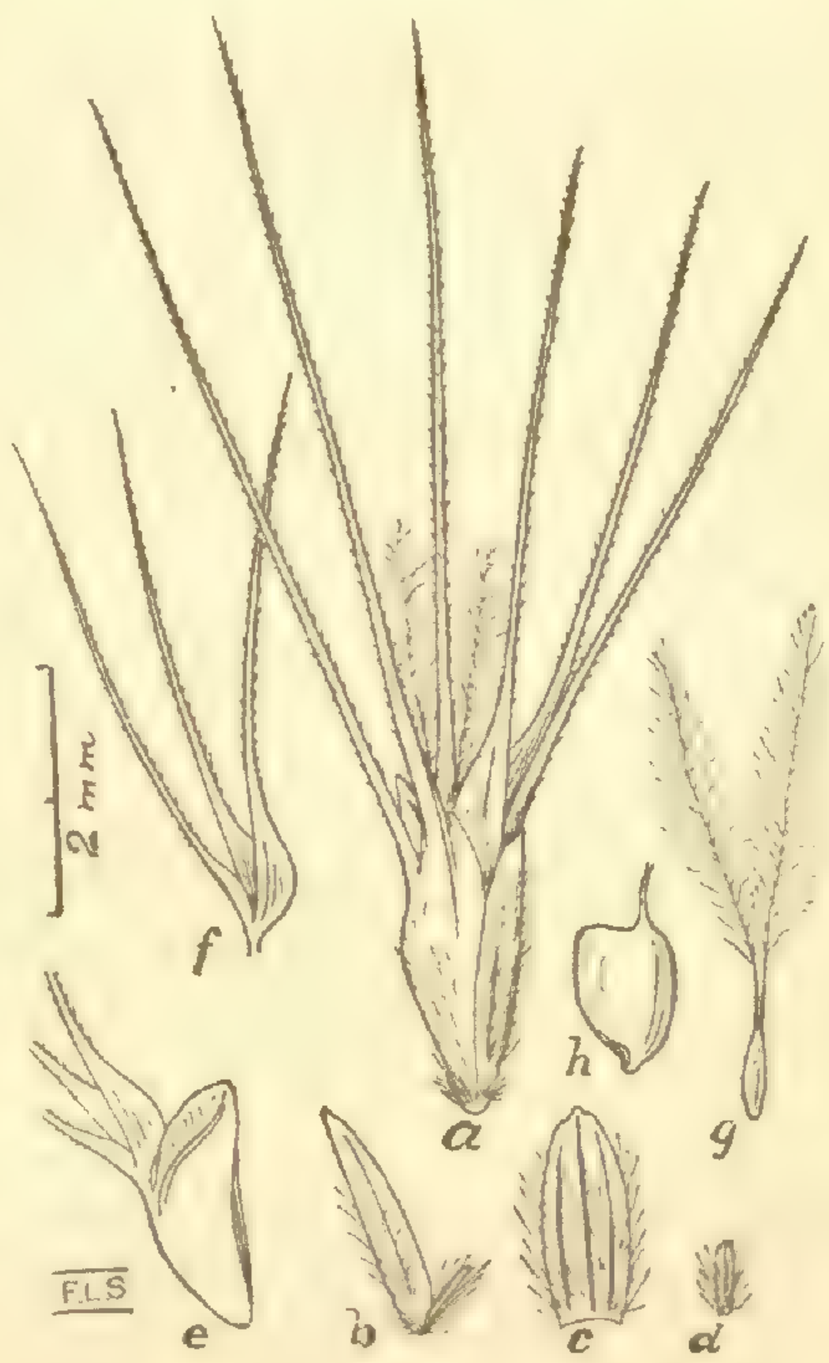

FIG. 4.—*Opizia stolonifera*: *a*, female spikelet; *b*, empty glumes; *c*, second empty glume; *d*, first empty glume; *e*, palea and adnate sterile rudimentary floret (*f*); *g*, pistil; *h*, caryopsis.

Gouinea virgata (Presl) Scribner. In tufts among the underbrush on hillsides. November, 1894 (77).

There are 3 species of Gouinea, 2 Mexican and 1 South American. The latter is represented in the National Herbarium by No. 928 Morong, plants of South America, distributed as *Triodia latifolia* (Griseb.). The species may be separated as follows:

1. Branches of the panicle flower-bearing above the middle, naked below, *G. latifolia*.
1. Branches of the panicle flower-bearing to near the base..... 2
2. Awns 1 line long or less; culms stout, 4 to 7 feet..... *G. mexicana*.
2. Awns 4 to 6 lines long; culms slender, 1 to 3 feet..... *G. virgata*.

G. virgata Scribn., *Bromus virgatus* Presl in Reliq. Haenk., 263. *G. polygama* Fourn. Mex. Pl. Enum., Gram. 103. *Festuca fournieriana* Hemsl. 505 Liebmann, St. Augustine, Mex., also 1087 E. Palmer, from Manzanillo, distributed as *Leptochloa* (?) *palmeri* Vasey.

G. mexicana Scribn. nom. nov. *Leptochloa* (?) *mexicana* Scribn. in Proc. Acad. Nat. Sci. Phila. 1891, p. 302. No. 3252 Pringle, 1890.

G. latifolia Scribn. nom. nov. *Tricuspis* (*Neuroblepharum*) *latifolia* Griseb. Plant. Lorenz., p. 259. No. 928 Morong.

Eragrostis ciliaris Link. Found in small bunches here and there on the steep rocky hillsides. October, 1894 (39).

Eragrostis plumosa Link. Found in moist shady spots in gardens and on river bottoms. October, 1894 (40).

Eragrostis reptans Nees. Growing in patches along the edge of alkaline spots surrounding a lagoon. March, 1895 (596). This is the form known as *Poa hypnoides* Lam.

Eragrostis amœna Presl. The specimens collected were found in a low wet place. The grass is not common. December, 1894 (286). Pringle's 3334, collection of 1890, from Guadalajara is the same. Pringle's specimens were referred to *Eragrostis vahlii* Nees. (see Scribn. Proc. Acad. Nat. Sci. Phila. 1891, p. 304), *Eragrostis amœna* being cited as a synonym. *Eragrostis vahlii* Nees is a taller, more branched paniculate form of South America, and is possibly specifically distinct from the Mexican grass here referred to.

Jouvea straminea Fourn., not Scribn. In large masses at the edge of a low damp place in a garden near the river bank. Plant produces long runners. Avoided by grass-eating animals. February, 1895 (443)=Liebmann 738. The female and what appears to be the male plant are also in the collection. This grass is very distinct, as shown by the female plants, from *Jouvea straminea* Scribn. (Bull. Torr. Bot. Club, **17**: 227), *Rachidospermum mexicanum* Vasey (Bot. Gaz., 15. 110). The plants are much more slender throughout, the leaves less rigid, the so-called spikes longer and much more slender, and the supposed spikelets free from the rachis in their upper half, as described by Fournier. These female spikes are less crowded, the internodes being much longer than in *Jouvea straminea* Scribn. There is a little uncertainty as to the staminate plants of the true *Jouvea straminea*. Dr. Palmer assures me, however, that the ♂ specimens in hand were collected in the same locality as the female plants. These staminate plants are more slender, with longer and less rigid leaves than those which are undoubtedly the male plants of *Jouvea pilosa*. There is little difference, however, to be noted in the spikelets of the two.

Jouvea pilosa (Presl.) Scribn. (Bull. Torr. Bot. Club, **23**: 143.) Found on the deep sands of the seashore in dense patches of greater or less extent. Too hard to be eaten by animals. December, 1894 (235). This grass is the *Rachidospermum* of Vasey; *Jouvea straminea* Scribn., not Fourn.; *Uniola pungens* Rupr. in Bull. Acad. Royal. Brux., vol. 9 (excluding the synonym); *Brizopyrum pilosum* Presl, Rel., Haenk., 1, 280. Presl's and Ruprecht's species were founded upon male plants. This species is represented in National Herbarium as follows: Liebmann 480 (Santa Cruz), ♂; E. Palmer 124 (La Paz, 1890), ♂ ♀; Xantus 121 (Cape San Lucas), ♂; Brandegee 42 (San Jose del Cabo, 1890), ♂ ♀; Palmer 1384 (Manzanillo), 1890, ♀; Liebmann 479 (St. Augustine, 1842), ♂.

III. SOME MEXICAN GRASSES COLLECTED BY E. W. NELSON IN MEXICO, 1894–95.

By F. Lamson-Scribner and Jared G. Smith.

The grasses here enumerated form a part of a general collection made in southern Mexico by Mr. Nelson under the direction of the Division of Biological Survey of this Department.

Saccharum cayennense Benth. (*Eriochrysis cayanensis* Beauv.). Vicinity of Choapam, Oaxaca; altitude, 3,800 to 4,500 feet. July 28, 1894; 886. Table-land about Ocuilapa, Chiapas; altitude, 3,400 to 3,800 feet. August 21, 1895; 3041, 3063. Culms 2 to 3 feet high.

Elionurus tripsacoides ciliaris Hack. Along a roadside between San Ricardo and Ocozucuantla, Chiapas; altitude, 2,600 to 3,300 feet. August 18, 1895; 2990.

Andropogon hirtiflorus pubiflorus Hack. Mountain ridge on the west side of the valley of Cuicatlan, Oaxaca; altitude, 6,500 to 8,000 feet. November 10, 1894; 1903. Leaves smooth and glaucous, hirsute toward the base, leaf sheath hirsute at the throat; culm nodes bristly pubescent; sessile spikelet about 7 mm. long, hairs at the base about 2 mm. long, hairs on the pedicel longer above; awn 25 mm. long, twice geniculate; anthers 1 mm. long; back of the first glume hairy below. In No. 1904 the first glume of the sessile spikelet is smooth, oblong, obtuse, about 5.5 mm. long, ciliate hispid along the keels near the apex; pedicellate spikelet staminate, the anthers 2 mm. long; awn 20 mm. long, and twice geniculate.

Andropogon tener Kth. Along roadsides between Tuxtla and San Christobal, Chiapas; altitude 2,300 to 5,500 feet. September 14, 1895; 3108.

Andropogon nutans stipoides Hack. Roadside between San Ricardo and Ocozucuantla, Chiapas; altitude, 2,600 to 3,300 feet. August 18, 1895; 2967. Table-land about Ocuilapa, Chiapas; altitude, 3,400 to 3,800 feet. August 21, 1895; 3008.

Andropogon bracteatus Willd. Near Yjalon, Chiapas. November 21, 1895; 3399.

Nazia racemosa aliena n. n. (*Lappago alienas* Spreng., *Lappago racemosa erecta* Kunth., *Tragus occidentalis* Nees.) Valley of Oaxaca; altitude 5,000 to 5,300 feet. September 20, 1894; 1278.

Paspalum conjugatum Berg. Table-land about Ocuilapa, Chiapas; altitude, 3,400 to 3,800 feet. August 21, 1895; 3055. Culms 1 to 2 feet high.

Paspalum erianthum Nees. Vicinity of San Juan Guichocovi, Oaxaca; altitude 450 to 1,500 feet. June 23, 1895; 2735, 2735*a*. A Brazilian species not previously reported from Mexico.

Paspalum fastigiatum Nees. Between Guichocovi and Lagunas, Oaxaca; altitude 600 to 900 feet. June 27, 1895; 2738. This agrees with 203 Liebmann, identified as above by Fournier, except that there are usually three empty glumes instead of two.

Paspalum lividum Trin. Tlacotalpam, Orizaba, Vera Cruz. May 21, 1894; 523.

Paspalum plicatulum Mx. Etigenia, Oaxaca; altitude 500 feet. July 18, 1895; 2853.

Paspalum squamatum Fourn. Vicinity of Totontepec, Oaxaca; altitude 5,500 to 7,000 feet. July 15, 1894; 727. This is the same as 198 Liebmann, and 2640 Bourgeau. Very near, if not identical, with *P. mandiocianum* Trin.

Paspalum stellatum Flugge. Near Caucuc, Chiapas; altitude 4,800 to 5,500 feet. November 24, 1895; 3421.

Paspalum virgatum L. Table-land about Ocuilapa, Chiapas; altitude 3,400 to 3,800 feet. August 21, 1895; 3035, 3047. Culms 3 to 6 feet high.

Anthaenantia lanata Benth. Vicinity of San Juan Guichocovi, Oaxaca; altitude, 450 to 1,500 feet. June 21, 1895; 2734.

Eriochloa nelsoni Scribn. & Smith, sp. nov. Culms branching from the base, ascending, 2 feet high, pubescent throughout; leaf-sheaths shorter than the internodes, ligule very short, ciliate; leaf-blades soft, flat, 3 to 6 inches long, linear-lanceolate, acuminate, pubescent on both sides; inflorescence terminal and lateral, long exserted, the main axis triquetrous, hirsute-pubescent; spikes 3 to 4, about 1 inch long, shortly pedicellate, sub-distant, erect or ascending, the triquetrous rachis narrow, hirsute; spikelets acute, 3½ lines long, on pubescent pedicels 1 line long at alternate joints of the rachis; empty glumes subequal obtuse or truncate, 5-nerved, appressed, ciliate on the back for the lower two-thirds, naked above and minutely scabrous; flowering glume smooth and shining, 2 lines long, obtuse, minutely cuspidate at the apex, with a pit or depression at the base. Caryopsis obovate, one-third shorter than the flowering glume, minutely reticulated. A very minute additional empty glume is sometimes present at the base of the spikelet.

Hills east of Cuicatlan, Oaxaca, Mexico; altitude, 2,000 to 4,000 feet. No. 1707, 1894. It has larger spikelets than any other species except *E. annulatus grandispicula* Doell., from which it may be readily separated by the form of the inflorescence.

Isachne disperma Doell. Chicharras, Chiapas; altitude, 3,000 to 6,000 feet. February 6, 1896; 3764.

Panicum bulbosum HBK. Eighteen miles southwest of the city of Oaxaca; altitude, 7,500 to 9,500 feet. September 12, 1894; 1374.

Panicum biglandulare Scribn. & Smith, sp. nov. (Plate IV.) Culms decumbent or ascending, branching, wiry, compressed, 2 to 4 feet long; nodes tumid; sheaths shorter than the internodes, open above, finely striate, glabrous except along the margins, which are clothed with glands bearing branching hairs; ligule a line of short hairs; leaves lanceolate, acuminate, rounded or subcordate at the base, and with a short pedicel one-half line long, sparsely glandular hispid on both sides, 2 to 4 inches long, 6 to 9 lines wide; inflorescence a racemose panicle about 4 inches long, the alternate, erect, sub-distant racemes 6 to 8 lines long, the main axis and its branches slender, angled, sparsely ciliate; spikelets alternate, almost sessile, 2 lines long; lowest empty glume ovate acute mucronate, 3-nerved, bristly hispid all over, nearly one-half line long, the bristles nearly as long as the glume; second empty glume nearly 2 lines long, elliptical-ovate acute, 7-nerved, bristly hispid all over, the bristles shorter than those of the first glume; third glume 2 lines long, 5-nerved, ovate, abruptly narrowed above and acute, laterally compressed, subventricose, scarious along the margins, bristly hispid along the lateral nerves, purplish, and bearing two glands, one on either side of the mid-vein, just above the middle; its palea scabrous on the keels to the base; fertile flowering glume 1 line long, narrowly lanceolate-elliptical, acute, coriaceous, smooth and shining; palea as long as its glume. Near Pinabete, Chiapas, February 8, 1896, at an altitude of 6,500 to 8,000 feet; No. 3781. Closely related to *Panicum uncinatum* Raddi, from which it differs in having more robust culms and larger leaves, smaller spikelets, the third glume with only two glands, and in the form of the inflorescence, which is similar to that of *Oplismenus*.

Panicum carthaginense Swz. Along a roadside between San Ricardo and Ocozucuantla, Chiapas; altitude, 2,600 to 3,300 feet. August 18, 1895; 2958. Culms 2 to 3½ feet high.

Panicum crus-ardeæ brevisetum Doell. (*Setaria effusa* Fourn.). Table-land about Ocuilapa, Chiapas; altitude, 3,400 to 3,800 feet. August 21, 1895; 3059. Tall grass 4 to 8 feet high.

Panicum divaricatum L. (*P. divaricatum latifolium* Fourn.). Near Tlalixtaquilla, Guerrero. December 10, 1894; 2254.

Panicum fasciculatum genuinum Doell. Between Topana, Oaxaca, and Tonala, Chiapas; altitude, 200 to 500 feet. August 1, 1895; 2874.

Panicum filiforme L. var.? (*Paspalum relutinum minus* Fourn.). Along roadsides between Tuxtla and San Cristobal, Chiapas; altitude, 2,300 to 5,500 feet. September 14, 1895; 3118. Culms 3 to 12 inches high; sheaths and leaf blades villose-hirsute; spikes mostly in threes, subdigitate, 1 to 1½ inches long; empty glumes densely ciliate.

Panicum glutinosum Swz. Turubula, Chiapas; altitude, 4,000 to 5,500 feet. October 25, 1895; 3357.

Panicum horizontale Jacq. Ocuilapa, Chiapas; altitude, 3,400 to 3,800 feet. October 21, 1895; 3049.

Panicum oajacense Steud. Table-land about Ocuilapa, Chiapas; altitude, 3,400 to 3,800 feet. August 21, 1895; 3055.

Panicum pilosum Swz. Table land about Ocuilapa, Chiapas; altitude, 3,400 to 3,800 feet. August 21, 1895; 3056.

Panicum prostratum Lam. Vicinity of Cuicatlan, Oaxaca; altitude, 1,800 to 2,500 feet. October 20, 1894; 1622.

Panicum sulcatum Aubl. Turubula, Chiapas; altitude, 4,000 to 5,500 feet. October 26, 1895; 3359. Culms 4 to 6 feet high.

Panicum xalapense HBK (teste Fourn.). Boca del Monte, Orizaba, Vera Cruz. This is the same as 2162 Bourgeau and 328 Liebmann. March 13, 1894; 201. Very near *P. laxiflorum* Lam.

Panicum zizanioides HBK. Table-land about Ocuilapa, Chiapas; altitude, 3,400 to 3,800 feet. August 21, 1895; 3023. Culms 10 to 18 inches high.

Oplismenus cristatus Presl. Vicinity of Cuicatlan, Oaxaca; altitude, 1,800 to 2,500 feet. October 10, 1894; 1649.

Oplismenus liebmanni Fourn. Near Reyes, Oaxaca; altitude, 5,800 to 6,700 feet. October 20, 1894; 1772.

Oplismenus loliaceus Beauv. Hacienda Mirador, Vera Cruz. February, 1894; 109. This is the same as 366 Liebmann.

Oplismenus setarius R. & S. Table-land about Ocuilapa, Chiapas; altitude, 3,400 to 3,800 feet. August 21, 1895; 3025.

Setariopsis latiglumis (Vasey) Scribn., Pub. Field Columbian Mus., Bot. Ser. I, 289 (1896). Tuxtla, Chiapas; altitude, 2,400 to 2,800 feet. September 6, 1895; 3083.

Setariopsis auriculata (Fourn.) Scribn. l. c. Vicinity of Cuicatlan, Oaxaca; altitude, 1,800 to 2,500 feet. October 14, 1894; 1601.

Pennisetum bambusæforme Vasey (*Gymnothrix bambusæformis* Fourn.). Plumia, Oaxaca; altitude, 3,000 to 4,800 feet. March 17, 1895; 2484.

Pennisetum multiflorum Fourn. Along roadsides between San Ricardo and Ocozucuantla, Chiapas; altitude, 2,600 to 3,300 feet. August 18, 1895; 2985. Culms 2 to 4 feet high. Table-land about Ocuilapa, Chiapas; altitude, 3,400 to 3,800 feet. August 21, 1895; 3065.

Pennisetum setosum Rich. (*P. purpurascens* HBK.). Between Petatlan and Chilapa, Guerrero; altitude, 5,000 to 6,500 feet. December 15, 1894; 2149. Near Tuxtla, Chiapas; altitude, 2,400 to 2,800 feet. September 1, 1895; 3090. Culms 4 to 5 feet high.

Savastana mexicana Beal, Grasses N. Am., II, 187, (*Hierochloë mexicana* Benth., *Ataxia mexicana* Fourn.). Summit of Mount Zempoaltepec, Oaxaca; altitude, 11,400 feet. July 9, 1894; 624.

Aristida fasciculata micrantha Vasey. Cuicatlan, Oaxaca; altitude 1,800 to 2,300 feet. October, 1894; 1654. This agrees with Vasey's type in habit, but the second empty glume is shorter than the flowering glume.

Aristida schiediana Trin. & Rupr. Near Reyes, Oaxaca; altitude, 6,700 to 10,000 feet. October 20, 1894; 1807.

Stipa cærulea Presl. Vicinity of Cerro San Felipe, Oaxaca; altitude, 9,500 to 11,000 feet. 1894; 1107. This agrees with Presl's description, except in having the leaves shorter than the culms. It is evidently closely related to *S. fimbriata* HBK.

Stipa virescens HBK. Eighteen miles southwest of the city of Oaxaca; altitude, 7,500 to 9,600 feet. September 10, 1894; 1373.

Oryzopsis fournieriana Hemsl. (*Stipa brevicalyx* Fourn.). Eighteen miles southwest of the city of Oaxaca; altitude, 7,500 to 9,500 feet. September 12, 1894; 1373*a*.

Muhlenbergia affinis Trin. Near Reyes, Oaxaca; altitude, 6,700 to 10,000 feet. October 20, 1894; 1806. Mountain ridge on west side of the valley of Cuicatlan, Oaxaca; altitude, 6,500 to 8,000 feet. November 10, 1894; 1905.

Muhlenbergia ciliata Trin. Valley near Cuicatlan, Oaxaca; altitude, 1,800 feet. November 3, 1894; 1869.

Muhlenbergia debilis Trin. About Cuicatlan, Oaxaca; altitude, 2,800 to 4,000 feet. 1894; 251, 1703*a*.

Muhlenbergia distichophylla Kth. Near Reyes, Oaxaca; altitude, 5,800 to 6,700 feet. October 20, 1894; 1780.

Muhlenbergia gracilis Trin. High ridge west of San Miguel Huantla, Oaxaca; altitude, 7,000 to 8,500 feet. November 11, 1894; 1910.

Lycurus phalaroides HBK. (*Muhlenbergia lycuroides* Vasey; *Lycurus brevifolius* Scribn.). San Cristobal, Chiapas; altitude, 7,000 to 8,800 feet. September 18, 1895; 3228. This agrees with HBK's description, except that the leaf sheaths are sparsely hirsute and the upper empty glume is not bifid or trifid at the apex. It is the same as 680 Botteri; 489 Palmer, 1886; and 2470 Pringle, 1889.

Pereilema crinitum Presl. Near Reyes, Oaxaca; altitude, 2,500 to 4,000 feet. October 24, 1894; 1822.

Sporobolus macrospermus Scribn. in Beal, Grasses N. Am., II, 302 (1896).[1] A slender, densely caespitose annual, 6 to 12 inches high, with rather short, narrow leaves, and an oblong or subpyramidal, open panicle 1 to 3 (usually about 2) inches long. Culms erect, smooth, sometimes branching near the base; sheaths lax, at least the lower ones, and these last sometimes ciliate along the margins and sparingly pilose; ligule nearly obsolete, very minutely ciliate; leaf blade 1 to 2 inches long or less, mostly less than a line wide, broadest at the base, smooth beneath, minutely scabrous above, ciliate along the margins, the hairs springing from distinct papillæ, apex pungent pointed. Panicle long exserted, the capillary branches spreading, flower bearing above the middle, 5 to 6 in the lower whorl, becoming fewer above, the longer lower branches one-half to three-fourths inch long. Spikelets 1 line long; empty glumes unequal, the first acute and about half as long as the second, which nearly equals the rather obtuse flowering glume; palea hyaline, rather broadly 2-lobed at the apex, and cleft to the base in fruit. Caryopsis somewhat exceeding the flowering glume in length, and protruding from the spikelet between the glumes and the cleft palea. (Fig. 5.)

FIG. 5.—*Sporobolus macrospermus*: *a*, spikelets; *b*, spikelet with ripe caryopsis; *c*, floret, with ripe caryopsis.

Along roadsides between Tuxtla and San Cristobal, State of Chiapas, Mexico, No. 3120, September 14, 1895. Also Guadalajara, State of Jalisco, Mexico, No. 2048 Pringle, 1888, and No. 2447 Pringle 1889; granitic soil, hills of Las Sedas, altitude 6,000 feet, State of Oaxaca, Mexico, No. 4943 Pringle, 1894; Laguna de Ayarza, Department of Jalapa, Guatemala, No. 3925 Heyde & Lux, 1892. Very closely related to if not identical with *Sporobolus rupestris* Kunth.

Epicampes berlandieri Fourn. Near Reyes, Oaxaca; altitude, 5,800 to 6,700 feet. October 20, 1894; 1778. Between Ayusinapa and Petatlan, Guerrero; altitude, 5,000 to 7,000 feet. December 14, 1894; 2122.

Epicampes mutica Rupr. Near Reyes, Oaxaca; altitude, 5,800 to 6,700 feet. October 20, 1894; 1779.

Trisetum deyeuxioides Kunth. (*Arena deyeuxioides* HBK; *Deyeuxia triflora* Nees.) West slope of Mount Zempoaltepec, Oaxaca; altitude, 7,700 to 8,000 feet. July 5, 1894; 554. This agrees in the details of the spikelets and in the form of the panicle with 733 Liebmann, collected at Chinantla, May, 1841, but the culm is shorter and more robust, and the leaves are shorter.

Trisetum paniculatum Fourn. Between Ayusinapa and Petatlan, Guerrero; altitude, 5,000 to 7,000 feet. December 14, 1894; 2123. A small form.

Graphephorum pringlei Scribn. in Beal, Grasses N. Am., II, 561 (1896). A slender, densely caespitose perennial, 1 to 2 feet high, with rather short and narrow leaves, and loosely flowered, open panicles 3 to 4 inches long. Culms erect, smooth, nodes very dark purple; sheaths striate, shorter than the internodes, smooth, or the lower ones more or less pubescent; ligule short, membranous, rounded obtuse, 1 line long or less, decurrent; leaf-blade 1 line or less wide; those at the base 3 to 6 inches long; those of the culm shorter and narrower,

[1] This description and some others here presented were in type before the publication of Beal's Grasses of North America, Vol. II.

sparingly pilose and minutely strigose-scabrous above; panicle branches slender, flexuose, ascending or finally more or less spreading, solitary or two or three together at the nodes and semi-verticillate, naked below, flower-bearing above, the lowermost 2 to 3 inches long. Spikelets ovate lanceolate, acute, 2- to 3-flowered, 2 to 3 lines long; outer glumes unequal, the first narrowly lanceolate and about 1 line long, acute, 1-nerved; the second broader, oblong lanceolate, obtuse, nearly 1½ lines long, 3-nerved; first flowering glume nearly 2 lines long, raised on a distinct callus, lanceolate oblong, obtuse or truncate and erose at the apex, 5-nerved, the mid-nerve often prolonged into a very short awn, the glume barbate at the base and pubescent on the back excepting in the upper third; second and third glumes similar to the first, but somewhat smaller; palea usually about one-fourth shorter than the glume, ciliate along the keels, excepting near the base; joints of the rachilla rather long and densely silky-bearded along the back with rather stiff hairs, prolonged above the uppermost flower into a slender plumose pedicel. (Fig. 6.) Summit of Sierra de San Felipe; altitude, 10,000 feet, State of Oaxaca, Mexico, No. 4765 Pringle, 1894; 1108 E. W. Nelson, same locality. This grass does not agree in all its characters with *Graphephorum*, nor with *Colpodium*, but its affinities are apparently with the former genus.

FIG. 6.—*Graphephorum pringlei*.

Campulosus planifolius Presl Reliq. Haenk. (*Ctenium glandulosum* Scribn. & Smith, Coult. Bot. Gaz., **21**: 362, 1896[1]). Zamatepec, Oaxaca, July 15, 1895; 2814.

Gouinia virgata (Presl) Scribn. (*G. polygama* Fourn., *Bromus virgatus* Presl). Near Tlalixtaquilla, Guerrero, December 10, 1894; 2255.

Poa conglomerata Rupr. Mount Orizaba, Pueblo; altitude, 14,900 to 15,000 feet. March 18, 1894; 287.

Festuca amplissima Rupr. Northwest side of summit of Mount Zempoaltepec, Oaxaca; altitude, 10,000 to 11,000 feet. July 9, 1894; 648.

Arthrostylidium racemiflorum Steud. (*Merostachys racemiflorum* Fourn.). Hacienda Mirador, Vera Cruz, February, 1894; 78.

Chusquea nelsoni Scribn. & Smith, sp. nov. Culms climbing, geniculate at the nodes, solid, one-fourth inch in diameter, slender, the internodes about 1 foot long with fasciculate lateral branches 8 to 12 inches long from the nodes; leaves 2 to 3 inches long, narrowly lanceolate acuminate, gradually rounding at the base into a short petiole, scabrous above and on the margins, hirsute-canescent below; ligule short, rounded; sheaths finely striate, smooth with a tumid ring at the base; panicle spikelike, contracted, interrupted below, 1 to 2½ inches long, once or twice compound, the branches strict; lowest empty glumes one-half line long, obtuse or truncate, shortly ciliate on the margins above; third empty glume 1½ lines long, ovate-lanceolate, acute, pubescent above, mucronate pointed; fourth empty glume more than half as long as the spikelet, like the third, with an awn 1 line long; flowering glume 3 lines long, 7-nerved, ovate, lanceolate, acuminate, sometimes mucronate, pubescent for the upper two-thirds; palea about as long as its glume, purple, sulcate and bicarinate, emarginate, bifid; stamens, 3; lodicules, 3, slender, acute, not fimbriate, style bifid at the apex. Between Chilapa and Tuxtla, Guerrero, Mexico; altitude, 5,200 to 7,000 feet; December 17, 1894; 2612. This species is related to *C. cummingii* Nees, differing in the shape and size of the lowest empty glumes, the pubescent flowering glume, and the tumid ring at the base of the leaf sheath.

[1] Since this publication the authors have seen a type specimen of *Campulosus planifolius* in the herbarium of the Missouri Botanical Garden, and *Ctenium glandulosum* S. & S. isidentical with it.

IV. SOME AMERICAN PANICUMS IN THE HERBARIUM BEROLINENSE AND IN THE HERBARIUM OF WILLDENOW.

By Theo. Holm.

The specimens which have been examined were mostly collected by American botanists, but several were also collected by Beyrich in the year 1834, and the latter have undoubtedly been revised by Kunth. Willdenow does not give the collector's name in most instances, but, as it will be seen later, some of his plants were collected by Muhlenberg.

FIG. 7.—"*Panicum laxiflorum* Lam. in fruticetis Caroliniae inf. Beyrich misit 1834:" *a*, a portion of the culm showing the hairy sheath and bearded node, the culm itself is glabrous: *b*, two spikelets, second and third glumes striate and downy. (Mus. Berol.)

FIG. 8.—"*Panicum ciliatum* Ell., *P. ciliatifolium* Kth. N. America, legit Engelmann:" *a*, a spikelet. Leaves ciliate, sheaths and culms glabrous. (Mus. Berol.)

There is no special herbarium of Kunth in Berlin, but his American types are scattered in various herbaria—for instance, in *Herbarium Berolinense* and in those at Kew and Paris. No type specimens were found of the species enumerated by Professor Scribner for special examination, but all the species named below have been examined and compared, most of which are represented in *Herbarium Berolinense*.

Attention is called to a very important fact, that the specimens which have been collected by American botanists are so wrongly identified that several species often occur under the same specific name.

The accompanying 9 figures have been drawn directly from the dried specimens, and give the exact appearance of the specimens and species in question as represented in the herbaria named.

PANICUMS IN THE HERBARIUM BEROLINENSE.

Panicum pauciflorum Ell. (on species cover). A few specimens, labeled *leucoblepharum*, collected in Oregon by Lyall, differ from the specimen submitted by Professor Scribner in having the pyramidal panicle branches shorter, and in being hairy all over excepting on the spikelets. The inflorescence reminds one very much of *clandestinum* L. The plant is very different from *P. rafinesquianum=oligosanthes* Schult. In the same cover are also some specimens of *P. nodiflorum* Lam., which are from Alexander Braun's herbarium, and these do not represent anything but our common *P. dichotomum* L. as it occurs in the vicinity of Washington, D. C.

FIG. 9.—"*Panicum setaceum* Muhl. Panici ramulosi var.? Herb. Hooker No. 100." Sheaths and lower part of the blades ciliate or pilose, otherwise glabrous; leaves rigid, involute. (Mus. Berol.) ½ nat. size.

FIG. 10.—"*Panicum cartilagineum* Muhl. Herb. Hooker No. 100." Second and third glumes pubescent; spikelets hairy. (Mus. Berol.) ½ nat. size.

Panicum laxiflorum Lam. (Fig. 7.) The figured specimen was collected by Beyrich, "in fruticetis Carolinae" (1834). It is very different from Curtiss's North American Plants, No. 3597, distributed under that name.

Panicum fragile Kth. Only one specimen, representing a young but typical *P.*

autumnale Bosc., labeled *P. divergens* Ell., collected by Beyrich "ad marginem agrorum Carolinæ."

Panicum consanguineum Kth. None of Kunth's own specimens are represented, only a few from Curtiss's N. Am. Pl., No. 3583.

Panicum ciliatifolium Kth. (Fig. 8.) The figured specimen was collected by Engelmann in North America, and labeled *P. ciliatum* Eng. Specimens from Carolina collected by Beyrich agree with these, but all the specimens are entirely different from *P. leucoblepharum*.

Panicum nitidum Lam. A chaos of species and varieties are named "*nitidum*," or at least are placed in the same species cover. The following are to be found: *P. commutatum* Schult.; typical specimens from Guatemala, but by Vasey identified as *nitidum*. *P. ramulosum* Michx.; collected in Florida by Cabanis. Specimens from Carolina by Beyrich agree with the smooth form I have collected in Brookland, D. C. The specimens in Nees ab Esenbeck's herbarium represent the common, hairy form, which I have found in Brookland, D. C. These specimens of N. ab Esenbeck are from New Orleans, and are labeled: "*P. nitidum* var. *villosum; P. pubescens* Lam.; *P. villosum* Ell." There are also in the same species cover (*nitidum*) a few specimens which are named *P. schlechtendalii* Klotzh=*P. acuminatum* Schlecht. from Caracas, collected by E. Otto. This *P. acuminatum* looks like a small *P. commutatum* Schult., the entire plant and the spikelets smaller. There is also a specimen of *P. pubescens* Michx. from the Antilles which is more hairy than the above-mentioned *P. acuminatum*. They are very likely identical, and represent perhaps forms of the Brookland, D.C., *P. nitidum*, although *P. acuminatum* in some respects resembles a dwarf *commutatum*. From Kunth's own herbarium there is a specimen labeled *P. schlechtendalii*, but this is the *sphærocarpon* like the one that grows on Bunker Hill, District of Columbia.

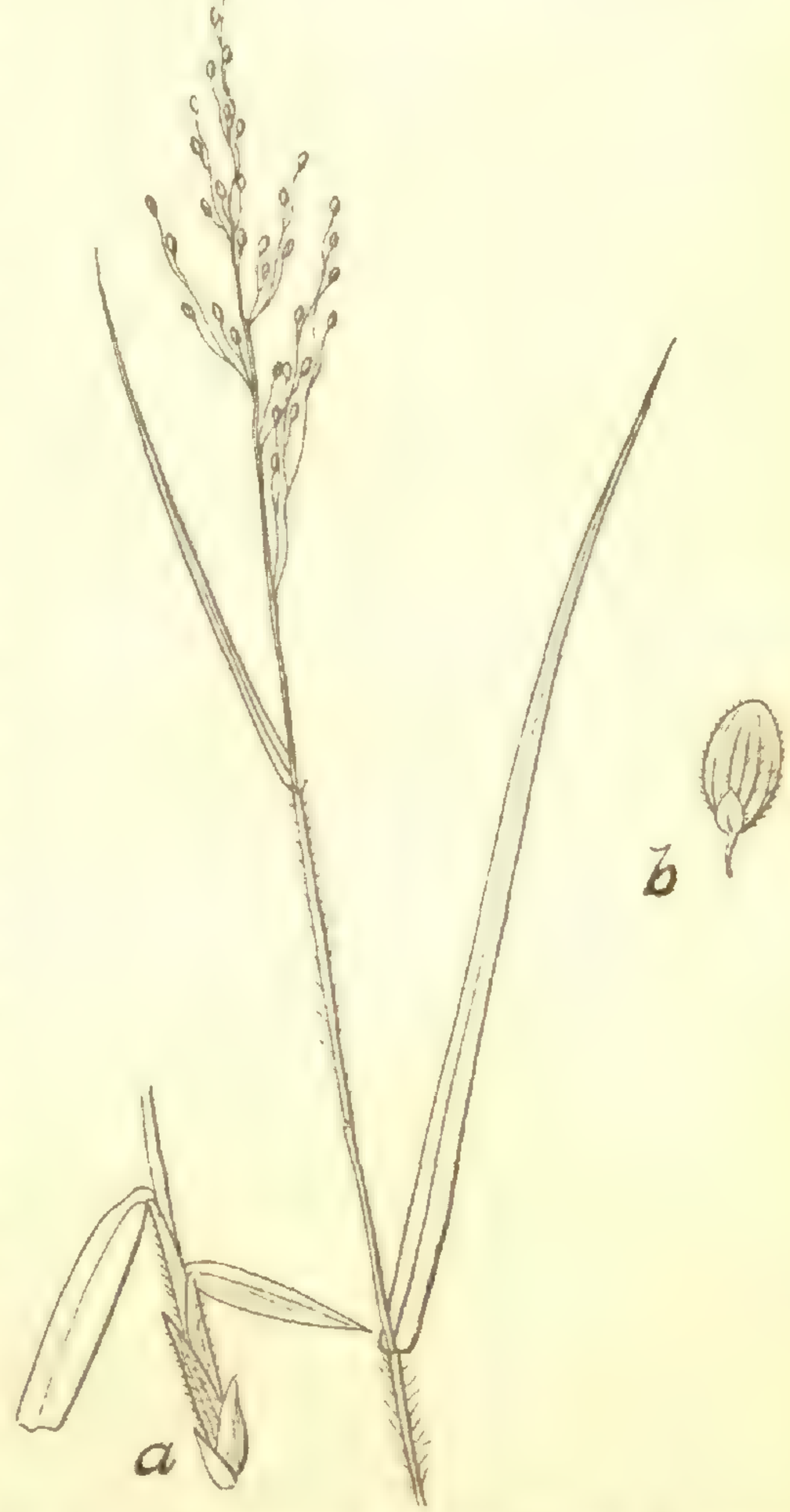

FIG. 11.—"*Panicum oligosanthes* Schult. *P. rafinesquianum* Schult. N. ab Esenb. in Herb. Lindl. New Orleans." Spikelets downy; leaf sheaths hairy. Plant about 18 inches high. (Mus. Berol.)

Panicum barbulatum Michx. There are several individuals so named in the Herbarium Beroïnense, but they represent more than one species. Engelmann has collected some of the specimens, which are all *sphærocarpon*, and on the label Elliott has written that the plant might be *sphærocarpon*. Cabanis has a specimen of *laxiflorum*, named *sphærocarpon*. Beyrich has the common form of *dichotomum*, the same as occurs in Brookland, D. C., the pale form with hairy nodes that grows in shade. But Beyrich also has some true *sphærocarpon* specimens which are labeled *barbulatum*. According to the Herbarium of Willdenow, the true *barbulatum* Lam. is nothing but the autumnal stage of *P. dichotomum* L.

Panicum coloratum L. This plant resembles *P. proliferum*, but the specimens from

Egypt, Africa, and Australia are all very different. A variety of *P. glaucum* from Africa looks like *P. hians*, but the rhizome is woody and covered with inflated, downy sheaths.

Panicum melicarium Michx. This is *P. hians* Elliott. Some specimens are labeled *P. milioides* Lam. and Nees ab Esenb.; also *P. miliare*, the last from New Orleans.

Panicum fuscum Sw. A large plant with long and broad leaves. The spikelets are obtuse, chestnut-colored and arranged on the lower face of the long branches. The panicle is rather contracted, something like that of Professor Scribner's specimen of *P. agrostoides*. Identical with *P. fuscum* are *P. fasciculatum* Swtz., and *P. fusco-rubrum* or *P. fusco-rubens* of Lam.

Panicum cognatum Schult. There is only one specimen named *P. divergens* Ell., but supposed to be identical with *P. cognatum*, and this specimen represents a true *P. autumnale* Bosc.

Panicum latifolium L. Some of the specimens are labeled "*P. walteri* Poir.," but none of them differ from the typical *P. latifolium*. One specimen is named *P. boscii* Poir., but this seems only to be a small form of *latifolium* L. It is from Herb. Desf., New York.

Panicum ensifolium Ell. From New Orleans is *P. microcarpon* Muhl. Some others are from Engelmann's herbarium, but are only small individuals of *P. microcarpon*.

Panicum agrostoides Muhlbg. This is united with *P. agrostidiforme* of Lam. Some are labeled *P. agrostoides* Sprgl., but these latter are *P. elongatum* of Pursh.

Panicum scoparium Lam. Beyrich's specimens agree with those of Professor Scribner.

Panicum microcarpon Muhlbg. A few specimens from Curtiss's North American Plants, No. 3599; these are, however, very different from the form I have found in Brookland, D. C., having very short and narrow leaves. They seem rather to belong to a form of *P. sphærocarpon*.

Panicum setaceum Muhlbg. (Fig. 9.) The specimen is from Hooker's herbarium and is labeled "*Panici ramulosi* var.?" The leaves are rather rigid, involute, and ciliate, with hairy sheaths; otherwise the plant is smooth. There is no doubt that this specimen is the autumnal stage of some narrow-leafed *Panicum*; but which?

FIG. 12.—"*Panicum barbulatum* Lam. *P. pubescens Mx.*?" (Willd. Herb. in Mus. Berol.)

Panicum enslini Trin. This specimen, a very young one, is a foot high and resembles *P. nitidum* from Brookland, D. C. It was collected in "Carolina australis" and is from Hooker's herbarium. On the label "*P. pubescens*" is written.

Panicum lanuginosum Ell. This species can not be determined from the herbarium material, since the cover contains more than one species. They are the following:

P. pubescens Lam. A true *P. sphærocarpon*, but out of flower, from Mexico.

P. pubescens Michx. A low, hairy plant, somewhat like *P. ciliatifolium*.

P. acuminatum; P. pubescens Michx. agrees with this and resembles *P. ciliatifolium*.

P. lanuginosum Ell., collected by Drummond, is a form of *P. dichotomum* L. (of Brookland, D. C.).

P. nitidum var., which is also *P. dichotomum* (the Brookland, D. C., form).

Panicum hydrophilum Trin. Specimens from Brazil, collected by Riedel, look like *P. agrostoides*, but the spikelets are still smaller and the leaves only an inch and a half in length.

Panicum cartilagineum Muhlbg. (Fig. 10.) One individual with three flowering stems from Hooker's herbarium, collected at New Orleans. The basal leaves are long and acute, the spikelets dark purple and hairy.

Panicum rafinesquianum Schult. (Fig. 11.) There are two specimens from Nees ab Esenbeck in the herbarium of Lindley, one of which I have drawn. The basal leaves are broad and short, the upper ones, on the contrary, long and linear; the panicle is somewhat narrow and resembles that of *P. depauperatum*, but the spikelets of *rafinesquianum* are smaller. The plant is nearly smooth, excepting the hairy sheaths and downy spikelets; the glumes are obtuse and distinctly 7-nerved. On the label is written "*P. oligosanthes* Schult. Mant. – *P. rafinesquianum* Schult." There is, however, another specimen from Alabama from Hooker's herbarium, which is labeled "*P. oligosanthes* Schult. var. *ramosum*," and this specimen is much branched, especially from the base, by which it reminds one more of *P. depauperatum* than of the Nees ab Esenbeck specimens. I think that *P. rafinesquianum* is well distinguished from *P. depauperatum*.

PANICUMS IN THE HERBARIUM OF WILLDENOW.

Panicum barbulatum Lam. (Fig. 12.) This is also labeled *P. pubescens* Michx. The specimen is only the autumnal stage of *P. dichotomum*.

Panicum laxiflorum Lam. (Fig. 13.) A young specimen with the spikelets, leaves, and sheaths minutely downy. On the label is also written "*P. heterophyllum* (W.)."

Panicum agrostoides Muhlbg. This is our *P. elongatum* Pursh. Willdenow has added on the label "*P. rigidulum* Bosc."

Panicum latifolium L. This is our typical species, but collected in the autumnal stage. It is also labeled "*P. walteri* Poir." and "*P. scoparium* Michx."

Panicum pauciflorum Bch. (probably Bischoff). (Fig. 14.) This is the autumnal stage of a narrow-leafed Panicum, perhaps *nitidum*. The glumes are downy, the leaves ciliate and the sheaths hairy.

Panicum clandestinum L. This is a few-flowered specimen of the autumnal stage, with the inflorescence concealed in the sheath.

Panicum rostratum (W.). This is our *P. anceps*.

Panicum dichotomum. This specimen from Virginia is our common form, but the autumnal stage with the spikelets dropped off the main inflorescense, and with a profuse development of lateral shoots with few-flowered inflorescences.

Panicum heterophyllum W. This specimen sent by Muhlenberg from North America is a typical *dichotomum* L., the form that is so common in Brookland, D. C.

FIG. 13.—"*Panicum heterophyllum* (W.) *P. laxiflorum* Lam. an Spr.?" Leaves, sheaths, and spikelets minutely downy. (Willd. Herb., Mus. Berol.)

Panicum tectum. (Fig. 15.) This specimen is labeled "*P. pubescens* Michx. var." and was collected by Muhlenberg in North America. The obtuse spikelets villous-pubescent, the leaves ciliate with hairy sheaths; the nodes have long retrorse hairs.

FIG. 14.—"*Panicum pauciflorum* Bosc.? Bischoff. *P. depauperatum* Muhl." Sheaths pilose, leaves and spikelets downy. (Willd. Herb., Mus. Berol.)

FIG. 15.—"*Panicum pubescens* Mx. Muhlenberg misit. Amer. borealis." Spikelets villous pubescent, sheaths hairy. leaves ciliate. (Willd. Herb., Mus. Berol.) ½ nat. size.

Panicum striatum. A specimen from North America is like the *P. nitidum* form with rather long leaves, from Brookland, D. C.

Panicum coloratum. This is our *P. virgatum*.

Panicum depauperatum. This is our typical form.

RÉSUMÉ.

Panicum:

fuscum Sw.	fasciculatum Sw. fusco-rubens Lam. fusco-rubrum Lam.
agrostoides Muhlbg.	agrostidiforme Lam.
elongatum Pursh	agrostoides Sprgl. rigidulum Bosc. agrostoides Muhlbg. fide Willdenow.
autumnale Bosc	fragile Kth. divergens Ell. cognatum Schult.
pauciflorum Ell.	leucoblepharum Trin.
dichotomum L.	nodiflorum Lam. barbulatum Michx. barbulatum Lam. pubescens Michx. heterophyllum W. (Muhlbg.) lanuginosum Ell.

nitidum Lam	nitidum var. villosum. pubescens Lam. villosum Ell, pubescens Michx. acuminatum Schlecht. schlechtendalii Kltzh. striatum (W.). enslini Trin. ?
rafinesquianum Schult	oligosanthes Schultes.
ramulosum Michx	setaceum Muhlbg. cartilagineum Muhlbg.
latifolium L	walteri Poir. scoparium Michx. fide Willdenow.
hians Ell	melicarium Michx. milioides Lam. et N. ab Es. miliare.
microcarpon Muhlbg	ensifolium Ell.
anceps	rostratum (W.).
virgatum	coloratum in the Willdenow Herbarium.

V. NATIVE AND INTRODUCED SPECIES OF THE GENERA HORDEUM AND AGROPYRON.

By F. Lamson-Scribner and Jared G. Smith.

HORDEUM.

Analytical key to the species.

1. Lateral spikelets sessile; species cultivated for the grain ..... *H. vulgare.*
1. Lateral spikelets not sessile 2

2. Floret of the central spikelet sessile 3
2. Floret of the central spikelet not sessile 9

3. Empty glumes all alike, subulate 4
3. Empty glumes not all subulate 7

4. Empty glumes 1 to 2½ inches long; lateral florets long-awned ..... *H. jubatum.*
4. Empty glumes less than 1 inch long; lateral florets merely subulate-pointed, not awned 5

5. Lateral spikelets flower-bearing ..... *H. boreale.*
5. Lateral spikelets neutral 6

6. Leaves pungent-pointed; flowering glume of the central spikelet 4½ to 5 lines long, its awn 10 to 12 lines long ..... *H. adscendens.*
6. Flowering glume of the central spikelet 3 to 4 lines long; its awn about the same length ..... *H. nodosum.*

7. Empty glumes of the middle spikelet lanceolate ..... *H. pusillum.*
7. Empty glumes of the middle spikelet setaceous 8

8. Inner empty glumes of the lateral spikelets obliquely lanceolate, one-half line wide ..... *H. maritimum.*
8. Inner empty glumes of the lateral spikelets slightly flattened, one-fourth line wide ..... *H. gussoneanum.*

9. Empty glumes of the central spikelet and the inner ones of the lateral spikelets ciliate along the margins with spreading hairs ..... *H. murinum.*
9. Empty glumes not ciliate ..... *H. montanense.*

Hordeum jubatum Linn. Sp. Pl. 85. In the West this grass causes much loss of stock on account of the injury the bearded joints of the spike cause to the mouth and throat of animals eating it in pastures or in hay. Common along the coast and in saline or cold, wet meadows of the interior.

Hordeum maritimum With. Arrang., 172. This species is distinguished from *H. nodosum* by the broadened inner empty glume of the lateral spikelets, which are sometimes staminate and distinctly awned. The spikes are also shorter and proportionately thicker. A native of the seacoast of western and southern Europe. Found on the seashores and in sandy sterile soils from Washington to Lower California.

Hordeum murinum Linn. Sp. Pl. 85. This species is at once distinguished by the ciliate, flattened, empty glumes of the central spikelets of each cluster and the inner glumes of each of the lateral spikelets. Naturalized near the coast from British Columbia to Lower California.

Hordeum pusillum Nutt. Gen. 1, 87. (*H. riehlii* Steud. Syn. Pl. Gram., 353.) Separated from *H. nodosum*, with which it has been confounded, by the dilated inner empty glumes of the lateral florets and the lanceolate empty glumes of the middle flower. Arid and saline or alkaline soils from Idaho and Utah to Arizona and eastward to Louisiana, Missouri, Illinois, Virginia, and South Carolina.

Hordeum adscendens HBK. A rather slender, erect, leafy annual (?) 2 to 3 feet high, with terminal bearded spikes 3 to 4 inches long. Culms terete, smooth, shining; nodes smooth, or the lower ones minutely puberulent; sheaths shorter than the internodes, the lower ones densely pubescent, the upper smooth, striate; ligule membranous, rounded, entire, about 1 line long; leaf blades rather rigid, 3 to 6 inches long, 2 to 3 lines wide, striate, scabrous, gradually narrowed to the pungently tipped apex. Axis of the spike compressed, scabrous or subciliate on the margins, the joints about 1 line long. Empty glumes setaceous, rounded on the back, sulcate on the inner face below, scabrous, those of the central spikelet about 1 inch long, those of the lateral spikelets a little shorter; flowering glume of the central spikelet 4½ to 5 lines long, lanceolate, smooth excepting near the apex, awned, awn 10 to 12 lines long, scabrous; palea about as long as the glume, scabrous on the keel above. Prolongation of the rachilla awn-like, and two-thirds as long as the palea. Lateral spikelets neutral, the pedicellate third glume about 3 to 3½ lines long, scabrous, subulate-pointed.—HBK., Nov. Gen. 1, 180. Distinguished from *H. nodosum* by its taller habit of growth, attenuate and pungently pointed leaves, longer spikes and longer-awned glumes, the empty ones being flattened or sulcate on the inner face and not terete throughout. Abundant along irrigation ditches near Glendale, Ariz. No. 2522 C. R. Orcutt, April 30, 1896.

Hordeum nodosum Linn. Sp. Pl. 126 (1762). This is an annual or perennial grass, similar in habit to *H. pusillum*, but is usually more erect and taller, and the empty glumes are not at all flattened or dilated above the base. In the Rocky Mountain region from Arizona to Montana and westward to northern California and Washington, and northward to Alaska.

Hordeum nodosum depressum Scribn. & Smith, var. nov. Low, 4 to 10 inches high, with shorter pubescent leaves, which are rounded at the base, and inflated upper leaf sheaths; empty glumes 9 lines long; fertile flowering glume narrower than in the species, with an awn as long as itself. In habit resembling *H. maritimum*, but with longer (1 to 2 inches) spikes, and with the details of spikelets those of *H. nodosum*.

Hordeum gussoneanum Parl. Pl. Palerm. in obs., 244. Slender ascending annuals 6 to 10 inches high, with the habit of *H. maritimum*, but the inner empty glumes narrowly flattened instead of wing-margined along the inner side. California to Oregon.

Hordeum boreale Scribn. & Smith, sp. nov. A slender, erect, and apparently perennial species, with rather broad, flat leaves, very smooth culms, and terminal spikes 3 to 4 inches long. Sheaths shorter than the internodes, the lower ones pubescent, the upper smooth and striate; ligule very short, scarious; leaf blades 4 to 6 inches long, 2 to 4 lines wide, scabrous, long acuminate pointed, those of

the innovations narrower and 6 to 9 inches long. Axis of the spike flattened, scabrous or subciliate along the edges, joints about 1 line long. Empty glumes setaceous and awn-like, subequal, 7 to 9 lines long, those of the lateral spikelets slightly exceeding the others; flowering glume of the central spikelets sessile, 5 lines long, broadly lanceolate, scabrous toward the apex, smooth below, awned; awn about 5 lines long; palea about as long as the glume, scabrous on the keels above, prolongation of the rachilla bristle-like, one-third to two-thirds as long as the palea. Flowering glume of the lateral spikelets pedicellate, about 3 lines long, lanceolate, subulate-pointed or short-awned; palea a little shorter than the glumes; usually there is a bristle-like prolongation of the rachilla behind the palea. The lateral spikelets are perfect, staminate or neuter, and are raised on curved pedicels nearly three-fourths of a line long.

Differs from *H. montanense*, to which it is most closely allied, in the shorter joints of the axis of the spike, longer pedicels, and the lateral spikelets and setaceous, awn-like, empty glumes. Taller and more erect than *H. nodosum*, with broader leaves, longer spikes, and more completely developed lateral spikelets. Aleutian Islands and Alaska to Oregon and California.

Hordeum montanense Scribn. in Beal, Grasses N. Am., II, 644. An erect leafy biennial or perennial 2 to 3 feet high, with smooth culms, scabrous leaves, and terminal spikes 2 to 3 inches long. Culms smooth and shining, glaucous at the nodes, sheaths shorter than the internodes, striate, smooth, or the lowermost sparingly pubescent; ligule very short, scarious; leaf blade 2 to 4 inches long, 2 to 3 lines wide, sharply acuminate pointed and somewhat pungent at the tips, with a distinct cartilaginous line along the margins. Empty glumes all alike, linear-lanceolate, scabrous on the back, 6 to 10 lines long, including the slender and scabrous awns. Central spikelet of each cluster, usually 2-flowered, the prolongation of the rachilla above the second flower sometimes tipped with the rudimentary glume, the first floret raised slightly above the empty glumes on a short stipe; the first flowering glume about 5 lines long, lanceolate, scabrous near the apex, awned; awn 8 to 9 lines long, the second floret raised upon a slender internode of the rachilla, which is 1 to 1½ lines long, the glume with its awn 6 to 7 lines long. Lateral spikelets nearly sessile, 2-flowered, similar to the central spikelet, excepting that the second floret is reduced to a small subulate-pointed glume about 2 lines in length.—Montana, No. 430, Scribner (1883).

At once distinguished from *H. boreale* by having the lateral spikelets nearly sessile, and the first floret of the central spikelet raised upon a short stipe.

AGROPYRON.

Analytical key to the species.

1. Cæspitose, the innovations intravaginal 2
1. Stoloniferous, the innovations extravaginal 12

2. Rachis of the spike breaking up at maturity, the joints falling with the spikelet ..... *A. scribneri.*
2. Rachis of the spike continuous 3

3. Spikelets strongly compressed, remote on the rachis 4
3. Spikelets subterete, approximate on the rachis 8

4. Empty glumes more than half as long as the spikelets or equaling them 5
4. Empty glumes half as long as the spikelet or less 6

5. Flowering glume awnless or with a short, straight, slender awn ..... *A. parishii.*
5. Flowering glume with a stout divergent or flexuose awn, equaling or longer than the spikelet ..... *A. scabrum.*

6. Spikelets erect ..... *A. vaseyi.*
6. Spikelets divergent 7

7. Culm leaves 6 or 7, empty glumes acuminate or awn pointed..... *A. arizonicum.*
7. Culm leaves 3 or 4, empty glumes acute or obtuse..... *A. divergens.*

8. Basal culm leaves shorter than the upper..... *A. gmelini.*
8. Basal culm leaves longer than the upper..... 9

9. Flowering glumes long awned..... 10
9. Flowering glumes awnless or short awned..... 11

10. Culms stout, erect; spikes erect..... *A. richardsoni.*
10. Culms more or less geniculate, ascending; spikes nodding..... *A. caninum.*

11. Spikes stout, 1 to 3 inches long, empty and flowering glumes broadest above the middle..... *A. violaceum.*
11. Spikes slender, 2 to 8 inches long, empty and flowering glumes broadest below the middle..... *A. tenerum.*

12. Empty glumes 9- to 11-nerved..... *A. junceum.*
12. Empty glumes 3- to 7-nerved..... 13

13. Apex of the flowering glume obtuse or truncate..... 14
13. Apex of the flowering glume acute or acuminate..... 15

14. Culms geniculate, empty glumes one-fourth shorter than the spikelet. *A. campestre.*
14. Culms erect, empty glumes half as long as the spikelet, truncate or oblique..... *A. glaucum.*

15. Spikes distinctly 4-angled, rachis articulated..... *A. tetrastachys.*
15. Spike not distinctly 4-angled, rachis continuous..... 16

16. Flowering glume with a geniculate divergent awn..... *A. albicans.*
16. Flowering glume with a straight awn or awnless..... 17

17. Spikelets compressed, ovate, acute, diverging..... *A. spicatum.*
17. Spikelets narrow, subcompressed, or subcylindrical acute or obtuse..... 18

18. Flowering glumes densely pubescent or lanate..... *A. dasystachyum.*
18. Flowering glumes smooth or scabrous..... 19

19. Leaves flat, smooth on the back; pilose along the nerves above..... *A. repens.*
19. Leaves becoming involute, scabrous on the back..... 20

20. Leaves strigose-pubescent above, spike elongated..... *A. lanceolatum.*
20. Leaves scabrous above, spike compact..... 21

21. Empty glumes less than half as long as the spikelet..... *A. riparium.*
21. Empty glumes about equaling the spikelet..... *A. pseudorepens.*

A. *Cæspitose, without creeping rootstocks or stolons.*

a. *Rachis of the spike continuous.*

* *Spikelets strongly compressed, remote.*

† *Empty glumes one-half as long as the spikelet or less.*

Agropyron divergens Nees in Steud. Syn. Plant. Gram., 347. This species has been referred by many authors to the Siberian *A. strigosum*; *Triticum strigosum* Lessing, not Boiss.; *Bromus strigosus* Bbrst., and to *Triticum caninum gmelini* Griseb. Thurber pointed out in Brewer and Watson's Botany of California (2:324), that it does not agree with *Triticum strigosum*, which has the empty glumes much longer and short-awned, the whole spikelet larger and more scabrous, and the basal leaves shorter than the culm leaves. The Asiatic material in the National and Gray herbaria confirms this conclusion.

Washington and Oregon to Montana, Colorado, and Arizona. Specimens in the National Herbarium from Washington: 1760, 1911, 1912 C. V. Piper, Pullman, 1894; 141 Vasey, 1883, and Cascade Mountains, 1889; 2135, 2136, 2140 Henderson, 1892; and 180 Suksdorf, 1885. Oregon: Spalding; Howell, 1881; 124, 151 Leiberg, 1894. California: Wilkes' Exploring Expedition. Nevada: 1332 S. Watson, 1868. Utah: 729 L. F. Ward, East Humboldt Mountains; and 1332 S. Watson, 1869, Black Rock. Idaho: Ainslee, 1871; 481, 559 Sandberg, Heller, and MacDougal, 1892; 2821 Henderson, 1894; 3702 Henderson, 1895; 2064 Rydberg, 1895. Montana: 423 Scribner, 1883; 330, 326, 472, 474, 559 Shear, 1895; 2103, 2110 Rydberg, 1895. Colorado: E. Hall, 1868; 83 Letterman, 1885. Arizona: J. G. Lemmon, 1882.

Agropyron divergens inermis Scribn. & Smith. var. nov. Empty glumes unequal. narrowly lanceolate, acute, 4 to 6 lines long; flowering glumes 5 to 6 lines long, smooth, flattened on the back, acute or acuminate, awnless or tipped with a straight or spreading, but not divergent, awn shorter than the glume. Distinguished from the species by its more slender and more densely caespitose culms, setaceous-convolute leaves, and muticous or short-awned flowering glumes; after flowering the spikelets very soon break up.

British Columbia to Utah and Idaho. Specimens in the National Herbarium from British Columbia: 98a John Macoun, Yale, 1889, Columbia Valley, July 10, 1885. Washington: 1913, 1914, 1915, 1916 Piper, 1894; Sandberg and Leiberg, 237, 1893. Idaho: 179 and 704 Sandberg, Heller and MacDougal, 1892; 2819, 2820, 2822, 2823 Henderson, 1894; 3058 Henderson, 1895. Utah: 361 Tracy, 1887, Ogden. There is also a single specimen, 469 Rydberg, 1891, collected in Banner County, Nebr., and distributed as *Agropyron tenerum* var., which differs only in having the bases of the culms clothed with dead leaf sheaths. There are also two specimens from Washington, Dr. Vasey, Cascade Mountains, 1889, and 1166 Suksdorf, 1889, which apparently connect this variety and the species. The spikelets are very much compressed, and the culm leaves are from 8 to 12 inches long.

Agropyron divergens tenuispicum Scribn. & Smith, var. nov. Culms 2 to 3 feet high; culm leaves 2 to 5 inches long, flat, becoming involute when dry, those of the innovations one-third as long as the culms and very narrow; spike slender, flexuous, 3 to 6 inches long, of from 8 to 14 erect 3- to 5-flowered spikelets; spikelets 5 to 7 lines long; awns 5 to 9 lines long, slender, flexuous, or divergent. Washington and Oregon to Wyoming and Montana. Specimens in the National Herbarium from Oregon: 181 Howell, 1885. Idaho: 179 and 297 Sandberg, Heller, and MacDougal, 1892. Utah: 158 Ward. Montana: 347 Shear, 1895; 2074, 2147 Rydberg, 1895. Wyoming: 623 Tweedy, 1885, Yellowstone Park.

Agropyron vaseyi Scribn. & Smith, sp. nov. Culms rigid, erect, wiry, 1 to 1½ feet high, with short involute setaceous culm leaves, and short, few-flowered interrupted spikes. Culms glabrous or glaucous, striate, terete; nodes glabrous; culm leaves 5 or 6; sheaths striate, glaucous, shorter than the internodes; ligule membranous, very minute; leaf-blades smooth and glaucous on the back, scabrous on the margins, minutely strigose-pubescent above, rigid, erect or ascending, 1 line or less wide, 1 to 3 inches long, those of the innovations 3 to 6 inches long. Spike very slender, 2 to 4 inches long, rigid or somewhat flexuose, of 6 to 8 sub-distant, 3- to 5-flowered, erect spikelets, 4 to 5 lines long; empty glumes oblanceolate, acute or acuminate, slightly unequal, scarious along the margins, 3 to 4 lines long; flowering glumes 4 lines long, lanceolate-acute and tipped with a stout divergent awn 4 to 5 lines long; palea shorter than its glume, rounded or obtuse.—*Agropyron divergens tenue* Vasey, in Macoun's Cat. Canad. Plants, vol. 4, p. 242, without description, not *A. tenerum* Vasey; *Triticum agilopoides* Thurb., not Turcz., in Gray, Proc. Phila. Acad., p. 79 (1863); *Triticum caninum* var. β Hook. Fl. Bor. Am., **2**:255.

This species is readily separated from *A. divergens*, with which it has been previously placed, by its shorter and narrower leaves, rigid and more wiry culms and fewer spikelets which are smaller in every way. Oregon and Washington to Wyoming and Colorado. Specimens in the National Herbarium from Washington: 2132 Henderson, 1892, distributed as *A. tenerum*. Oregon: Henderson, 1884, Hood River Station. Montana: 461 S. Watson, 1880; 2164, 2299, 2301, 2356, Rydberg, 1895. Wyoming: 44 and 45 Letterman, 1884; Burglehaus, 1893; Evermann, 1893. Colorado: J. Wolfe, 1873.

Agropyron arizonicum Scribn. & Smith, sp. nov. Glaucous, 1½ to 2 feet high, with flat, soft leaves. Culms glabrous or minutely scabrous below, cylindrical, striate, clothed at the base with papery leaf sheaths. Culm leaves 6 to 7. Sheaths longer than the internodes, open at the throat, sparsely hairy; ligule short.

membranous; leaf blade linear, attenuate-pointed, 5 to 9 inches long, 3 lines wide or less, smooth below, scabrous on the margins, strigose-pubescent above, those of the innovations 9 to 14 inches long; spike nodding, 5 to 9 inches long, of seven to fourteen 5- to 7-flowered spikelets, 9 to 12 lines long; empty glumes narrowly lanceolate, acuminate or short-awned or unequally bidentate, about equal, 3- to 5-nerved, half or less than half as long as the spikelet; flowering glumes linear lanceolate, 5 to 7 lines long, acuminate, scabrous, tipped with a stout, scabrous, divergent awn, about 1 inch long; internodes of the rachilla 1½ lines long, slender, glabrous; palea shorter than its glume, acute. This species is distinguished from *A. divergens*, to which it has been referred, by its more numerous, longer, and broader culm leaves, more flexuous spike, stouter awns, and by the very acute empty glumes.

In the mountains of New Mexico, Arizona, and Chihuahua. Specimens in the National Herbarium from New Mexico: 3174 Lemmon, 1884, near Laguna. Arizona: 67 Nealley, 1891, Rincon Mountains; 2929 Lemmon, 1882, Huachuca Mountains; Dr. Wilcox, 1894, Fort Huachuca. Rocky Mountains: C. V. Riley, without date or locality. Chihuahua: 1139 Pringle, 1887, Sierra Madre. Also collected in the Organ Mountains by Bigelow, 1851 (Gray Herb.).

†† *Empty glumes two-thirds as long as the spikelet or equaling it.*

Agropyron parishii Scribn. & Smith, sp. nov. Culms 2 to 3½ feet high, with flat leaves and erect or nodding spikes 6 to 12 inches long. Culms cylindrical, glabrous, striate, or smooth and shining below; nodes tumid, retrorsely pubescent; leaf sheaths striate, pubescent below, and sparingly ciliate along the margins, the basal ones shorter, the upper longer than the internodes; ligule membranous, very short; leaf blade constricted at the base, smooth on the back, scabrous above and on the margins, 2 to 3 lines wide, linear attenuate to the acute apex, the lower culm leaves 6 to 9 inches, and the uppermost 1 to 2 inches. Spike of 8 to 12 compressed oblanceolate spikelets. Spikelets 5- to 7-flowered, 8 to 10 lines long, shorter than the internodes of the rachis, which is scabrous on the margins; empty glumes two-thirds as long as the spikelets, nearly equal, linear, acute or acuminate, 5-nerved, scarious on the margins; flowering glume lanceolate, acute, 4½ to 5½ lines long, flattened on the back below, prominently 5-nerved above, and scabrous toward the minutely 3-toothed awnless or short-awned apex. Awn, when present, straight, slender, 3 to 4 lines long. Internodes of the rachilla 1 line long, minutely pubescent. Palea as long as its glume, acute or obtuse. Represented in the National Herbarium by specimens collected by S. B. Parish in Waterman's Cañon, San Bernardino Mountains, California, at an altitude of 3,000 feet, No. 2054, June 28, 1888, and No. 2238, June 23, 1891.

This species apparently connects *Agropyron* with *Brachypodium*. The habit is similar to that of *A. arizonicum*. It is the only American species with pubescent culm nodes.

Agropyron parishii læve Scribn. & Smith, var. nov. With the habit of the species, but the culm nodes and leaf sheaths glabrous; awns as long as or longer than the flowering glumes. Type in the Gray herbarium No. 414, Dr. Edward Palmer, collected at Fowleys, Cuiamaca Mountains, in the southern part of San Diego County, Cal., 1875.

Agropyron scabrum Beauv. A pale glaucous species, 2 to 3 feet high, with flat, rigid, striate leaves, glabrous on the back; sheaths longer than the internodes; spikes 10 to 16 inches long, of 10 to 14 narrow, erect spikelets; empty glumes cartilaginous, 6 to 8 lines long, lanceolate-acuminate, 5-nerved, the margins smooth and shining; flowering glume shorter than the longest empty glume, smooth and shining, tipped with a flexuose or divergent awn 8 to 18 lines long.—Beauv. Agrost., 102. Distinguished from *A. arizonicum*, with which it might be confounded, by its larger, more robust culms, broader leaves, larger spikelets,

larger and firmer empty glumes, and longer awns. It is an Australian grass which has been introduced into some parts of California.

Specimens in the National Herbarium: 6468 Bolander, without date or locality; Miss Norton, San Jose, 1879; and Bolander 1510. in Herb. Gray, ex Thurb., and in Herb. Missouri Botanical Garden.

Spikelets subterete, approximate.

† *Basal culm leaves longer than the upper ones, empty glumes awnless.*

‡ *Flowering glumes long-awned.*

Agropyron richardsoni Schrad. (fide Kew Index). *Triticum richardsoni* Trin. in Reliq. Scrad., Linn., **12**: 467 (1838), according to a specimen from the St. Petersburg Academy in the Gray Herbarium. *Agropyron unilaterale* Cassidy, Bull. Colo. Expt. Station **12**: 63 (1890); *A. caninum unilaterale* Vasey, Contr. U. S. Nat. Herb., **1**: 279, not *A. unilaterale* Beauv. Agrost., 102. *A. violascens* Beal, Grass. N. Am., II, 635 (1896).

From the Saskatchewan to the mountains of Colorado. Specimens in the National Herbarium from British Columbia: 103 J. Macoun, 1889, Spencer Bridge; 29 and 33 J. Macoun, 1872, Saskatchewan plains; 117 J. Macoun, 1879, Red Deer Lakes. Minnesota: Ballard, 1893, Cass County. South Dakota: Geyer, 1839, James River; Dudley, 1883. Montana: Scribner, 1883. Nebraska: Bates, 1892. Colorado: Crandall, 1890; 1169, J. Wolfe, 1873; Dr. Vasey, 1884, Pen Gulch and Veta Pass. Specimens in the Gray herbarium, British Columbia: Richardson, type collection; Bourgeau, 1858, Saskatchewan; J. Macoun, 1880, Cypress Hills. Montana: 422 Scribner, 1883. Colorado: E. Hall, 1864; 210 Hall and Harbour, 1862; 881 and 1168 J. Wolfe, 1873, Twin Lakes; 446 E. L. Greene, 1870, high mountains near Golden.

Agropyron richardsoni ciliatum Scribn. & Smith, var. nov. Leaf sheaths and leaf blades pilose-pubescent; ligule 1 line long; spikelets 8 lines long; empty glumes 5- to 7-nerved, tipped with an awn as long as the spikelet.

In the Belt Mountains, Montana; altitude, 4,500 feet; F. Lamson-Scribner, July, 1883.

Agropyron caninum Beauv. Agrost., p. 102. *Triticum caninum* Linn. *A. caninoides* Beal, Grass. N. Am., II, 640 (1896). Distinguished from *A. repens* by its intravaginal innovations; leaves scabrous on both surfaces; more crowded erect spikelets; long-awned flowering glumes, and nodding spikes. It may be distinguished in the field by its very much brighter green color.

New England States, Nova Scotia, Canada, and westward through the region of the Great Lakes to the Black Hills of South Dakota and the Rocky Mountains. It has also been introduced with European grain and grass seeds quite widely through the Northern and Middle States.

Forms of this, with unilateral spikes, have been referred to *A. richardsoni*, which has awns three or four times as long as those of *caninum*, and the flowering glume bidentate below the origin of the awn. Slender forms have been referred by collectors to *A. tenerum* Vasey, and forms with short compact spikes and short awns to *A. violaceum* Vasey.

Agropyron caninum pubescens Scribn. & Smith, var. nov. The leaf sheaths and leaf blades densely clothed with retrorsely ciliate pubescence. Collected by John Macoun at Little Sheisemp Lake, British Columbia, No. 99, June 18, 1889.

‡‡ *Flowering glumes awnless or short-awned, spikes erect.*

Agropyron tenerum Vasey in Coult., Bot. Gaz., **2**: 258 (1885). New Mexico and southern California to Washington and British Columbia, and eastward to Colorado, and Nebraska, Minnesota, the White Mountains of Vermont, and New Hampshire and Labrador.

Specimens in the National Herbarium marked *A. violaceum majus* Vasey, belong partly here, and in part to *A. pseudorepens*. *A. violaceum* of many Western collectors also belongs here.

Agropyron tenerum ciliatum Scribn. & Smith, var. nov. Sheaths pubescent, or the lowest ones densely hairy. From Minnesota to Nebraska and Utah.

Agropyron tenerum longifolium Scribn. & Smith, var. nov. Three to 4 feet high, with smooth and shining rigid culms, long, attenuate-pointed, involute leaves nearly as long as the culm, and slender cylindrical spikes, 6 to 10 inches long; empty and flowering glumes short-awned.

Northern California to British Columbia. Type specimens collected by Thomas Howell, 256 (1887), near Giant's Pass, Oregon. There is also a specimen which was exhibited by the Oregon World's Fair commission, collected in 1892. One sheet of Bolander's 6110, from probably northern California, belongs here.

Agropyron violaceum Vasey. Grass. U. S.; Special Rept. Dept. of Agriculture, No. 63, p. 45, 1883. *Triticum violaceum* Hornem., Fl. Dan. t. 2044 (1832). The typical or European form of this species is represented in the National Herbarium by specimens from Grinnell Land, collected by Gen. A. W. Greely in 1883, and from Labrador, Nova Scotia, and the White Mountains. Very closely approaching this, and not sufficiently distinct to be distinguished as a variety, is a form widely distributed in the Rocky Mountains from Colorado to Alaska and northward from the Saskatchewan plains to the Arctic Circle, with more slender culms 1½ to 2½ feet high, and rigid leaves 3 to 7 inches long, becoming convolute when dry, the uppermost leaf blade shorter than its sheath, sometimes very short, those of the innovations often 7 or 8 inches long.

Specimens in the National Herbarium: Grinnell Land, General Greely, 1883. Labrador: 676 Towner and 6071 Low, 1894. New Hampshire: C. Faxon, 1882. Colorado: Crandall, Cameron Pass, 1890. Utah: 77b, 440, 1517 M. E. Jones, 1879, distributed as *Triticum repens* var. *compactum* Vasey; 349 Tracy, 1887; 582 Ward, Aquarius plateau. British Columbia: 71 Macoun, 1872; 97 Rothrock, 1866. Alaska: 88 Dawson, 1887, Yukon River.

Agropyron violaceum latiglume Scribn. & Smith, var. nov. Culms 10 to 16 inches high, erect, rigid, wiry. Culm leaves 1 to 2 inches long, glaucous, convolute when dry, linear-lanceolate, acute, hairy on both sides, scabrous on the margins and upper surface, the uppermost leaf one-half to three-fourths inch long. Spikes long exserted, 1 to 2 inches long. Empty glumes oblanceolate, acute, with broad, scarious margins, short-awned or awnless, becoming flat with age; flowering glumes rounded on the back, densely pubescent; leaves of the innovations like those of the culm, 1 to 2 inches long.

From Montana to Alaska. Specimens in the National Herbarium: 1011 Tweedy, 1886, from Lone Mountain, Gallatin County, Mont., and 36 Dawson, 1887, Yukon River, Alaska.

Agropyron violaceum andinum Scribn. & Smith, var. nov. Culms geniculate, densely tufted, weak, 8 to 14 inches high. Spike short and compact, 2 to 3 inches long, awns as long as or longer than the flowering glumes. Empty and flowering glumes 4 to 5 lines.

High mountains in Colorado above timber line. No. 720 Jones, 1878, Grays Peak; 35 and 37 Patterson, 1885, Grays Peak; 62 and 104 Letterman, 1885, Kelso Mountain; 392 and 693 Shear, 1895, Grays Peak.

†† ***Basal culm leaves shorter than the upper ones.***

Agropyron gmelini Scribn. & Smith, sp. nov. Culms 2 to 4 feet high, erect, rather slender, glabrous, cylindrical; nodes brownish; sheaths longer than the internodes, open at the throat, glabrous, shorter than the blades; ligule very short, membranous; culm leaves 4 or 5, the upper ones 5 to 12 inches long, linear, attenuate-pointed, glabrous below, scabrous on the margin and strigose or minutely

scabrous above, the radical leaves 1 to 3 inches long and 2 to 3 lines wide. Spike slender, 4 to 10 inches long, of 10 to 20 spikelets. Spikelets 6 to 9 lines long, 7- to 9-flowered, subterete or compressed; empty glumes unequal, 5 to 7 lines long, oblong-lanceolate, acuminate and short-awned, two-thirds as long as the spikelet; flowering glumes narrowly oblong-lanceolate, acuminate, 5 to 6 lines long, awned from or just below the apex with a slender, divergent, scabrous awn 8 to 15 lines long; palea shorter than its glume; internodes of the rachilla terete, nearly smooth.

This plant agrees with the figure and description of *Triticum caninum gmelini* Griseb. in Ledeb. Icon. Fl. Ross. t. 248. It differs from *A. divergens tenuispicum* in having a more slender spike, awned scabrous empty glumes, upper culm leaves longer than the basal ones, and the spikelets less strongly compressed, and erect. It is closely related to *A. violaceum*.

Washington to western Nebraska. Specimens in the National Herbarium from Washington: 1167 Suksdorf, 1889, Rock Creek. Idaho: 3274 Henderson, 1895, Wood River; 178 Sandberg, Heller, and MacDougal, 1892, Clearwater River; 2327 Rydberg, 1895, Beaver Canyon. Montana: 379 Shear, 1895, Deer Lodge; 2233 Rydberg, 1895, Baldy Peak. Wyoming: 625 Tweedy, 1885, Cache Creek. Nebraska: 1617 Rydberg, 1893, Grant County.

Agropyron gmelini pringlei Scribn. & Smith, var. nov. Culms low, tufted, 8 to 12 inches high, geniculate at the base; the leaves 2 to 4 inches long, 1 to 2½ lines wide, rigid, acute, glaucous below, strigose above. Spikes loose, few-flowered; awns of the flowering glumes 1 inch long.

High mountains in Wyoming and California. Specimens from California: Pringle 1882, Sierra Nevada Mountains above Summit Valley. This is, in part, Vasey's type of *A. scribneri*. Wyoming: 234 and 695 J. N. Rose, 1893, mountains in Yellowstone National Park, 10,000 feet, distributed as *A. scribneri*. In the Gray herbarium, from California: 33 J. W. Congdon, Mount Hoffman, Mariposa County, 1890; 2118 Brewer, Carson Pass.

b. *Rachis of the spike breaking up at maturity, the joints falling with the spikelets.*

Agropyron scribneri Vasey. Torr. Bull. **10**: 128. Above timber line on high mountains from Montana to Arizona. Specimens in the National Herbarium from Montana: 427 Scribner, 1883 (type). Colorado: 4 Patterson, 1875; 162 Patterson, 1885, Grays Peak; 2453 Rydberg, 1895, Grays Peak; 86 and 103 Lemmon, 1884, Pikes Peak; 28 Canby, 1895, Pikes Peak. Arizona: 905 Rusby, 1883, summit of Mount Humphrey.

B. *Culms from creeping rootstocks, not cæspitose.*

a. *Empty glumes 9- to 11-nerved.*

Agropyron junceum megastachyum Fries. A maritime perennial with geniculate ascending culms one-half to 1½ feet high; long creeping rootstocks; convolute-filiform carinate leaves, and broad flat spikelets. Spikelets obovate, obtuse, 5- to 8-flowered, 1 inch long, 5 to 7 lines wide, rather remote; empty glumes 6 to 8 lines long, cartilaginous, blunt; flowering glume narrower, truncate, mucronate. Rachilla fragile.—Fries. Mant. 3: 12.

Introduced along the coast near San Francisco, Cal., as a sand-binder. Represented in the National Herbarium by specimens collected by J. W. Congdon, Lake Merced, San Francisco, July, 1893.

b. *Empty glumes 3- to 7-nerved.*

* *Apex of the flowering glume obtuse or truncate.*

Agropyron campestre Godr. & Gren., Fl. Fr. **3**: 607. Sparingly introduced as a ballast plant at Camden, N. J.

Agropyron glaucum Roem. & Schult., Syst. **2**: 752. *Triticum glaucum* Desf.; *T. intermedium* Host. Sparingly introduced as a ballast plant, New Jersey and Connecticut.

** *Apex of the flowering glume acute or acuminate.*

† *Spikelets much compressed, distichous in two parallel planes so that the spike is distinctly 4-angled; rachis articulated, breaking up at maturity.*

Agropyron tetrastachys Scribn. & Smith, sp. nov. A maritime glaucous species with slender, erect, rigid culms, 2 to 3 feet high, spreading leaves, and pale greenish or straw-colored spikes. Culms striate, smooth; nodes brownish, glabrous; sheaths striate, smooth, shorter than the leaf blades and internodes; ligule obsolete; leaf blades 4 or 5, linear, long, attenuate-pointed, rigid, 6 to 8 inches long, 2 lines or less wide, glabrous on the back, scabrous on the margins, closely striate-nerved and glaucous above, scabrous along the nerves. Spikes long-exserted, 4 or 5 inches long, the rachis 4-angled, glaucous, scabrous on the angles; spikelets 15 to 20, 7- to 11-flowered, 6 to 10 lines long, 3½ to 5 lines wide, parallel to the rachis and overlapping one another; empty glumes about equal, lanceolate, and mucronate pointed, the lower 3-, the upper 5- to 7-nerved, about 5 lines long, carinate toward the apex, smooth, excepting along the keel; flowering glume lanceolate, acute, keeled, mucronate or tipped with a short awn, scabrous above the middle; palea as long as its glume, acute; internodes of the rachilla very short and obconical. Allied to *A. spicatum* (Pursh.).

✓Sandy beaches, Cape Elizabeth, Me. Specimens in the National Herbarium collected by F. L. Scribner, July 26, 1895. Gray herbarium.—E. Tuckerman, August, 1860, Cape Elizabeth.

†† *Spikes not distinctly 4-angled, rachis continuous.*

‡ *Flowering glume tipped with a geniculate divergent awn.*

Agropyron albicans Scribn. & Smith, sp. nov. Stoloniferous perennial with bluish-green leaves and much compressed, pubescent, distant spikelets, with geniculate divergent awns. Culms slender, erect, 1 to 2 feet high, glaucous, clothed at the base with dead leaf sheaths; culm leaves 3 to 4; sheaths glaucous, smooth, shorter than the internodes; ligule very short, membranous; leaf-blade rigid, ascending, linear involute, scabrous throughout, 3 to 5 inches long, 1 to 2 lines wide, those of the sterile shoots glaucous, half as long as the culm; spike long-exserted, slightly nodding, 3 to 4 inches long, of 8 to 10 spikelets; spikelets 5- to 7-flowered, 8 to 9 lines long, distant on the rachis, ascending or erect; empty glumes half to two-thirds as long as the spikelet, indurated at the base, broadly 3- to 5-nerved, pubescent, oblanceolate, acuminate, tipped with an awn 2 to 3 lines long; flowering glumes 4½ lines long; ovate lanceolate, rounded on the back, densely pubescent, tipped with a stout, scabrous, divergent awn 6 to 8 lines long; palea as long as its glume, bidentate; internodes of the rachilla pubescent.✓Collected by Mr. P. A. Rydberg at Yogo Gulch, Montana, altitude 5,000 feet (No. 3405), August 22, 1896.

Closely related to *A. dasystachyum* and *A. spicatum molle*, from both of which it is separated by the divergent geniculate awns of the flowering glume. The spike has a whitish aspect, hence the specific name.

‡‡ *Flowering glume awnless, or with a straight awn.*

— *Spikelets acute, compressed, diverging, the empty glumes as long as the spikelet.*

Agropyron spicatum Scribn. & Smith, nom. nov. Glaucous, 1 to 4 feet high, with compressed acute spikelets. Culms rigid, erect, striate, with 3 or 4 leaves and brown nodes. Sheaths striate, smooth, shorter than the internodes; ligule very short, often purplish; blades erect, spreading, rigid, bluish-green, smooth or slightly scabrous on the back, rough-scabrous on the margins and along the prominent nerves above, becoming involute, 4 to 7 inches long, 2 to 3 lines wide, those of the innovations narrower and often half as long as the culms. Spikes exserted, 3 to 7 inches long. Spikelets yellowish-green, one-half to 1 inch long, 7- to 13-flowered, spreading, usually somewhat distant, single or in pairs, lanceolate-acute; empty glumes lanceolate, linear, acuminate or awn-pointed, one-half or two-thirds as long as the spikelets, scabrous on the nerves, slightly unequal, often oblique; flowering glumes 4 to 6 lines long, narrowly lanceolate, acute, acuminate, mucronate, or awn-pointed, rounded on the back, smooth or thinly pubescent; palea a little shorter than its glume, scabrous along the margins above; internodes of the rachilla cylindrical, very minutely scabrous.—*Festuca spicata* Pursh, Fl. Am., Sept., Vol. I, p. 83; *Triticum missouricum* Sprengel Syst. Veg., 325 (1825); *Agropyron glaucum occidentale* Vasey & Scribn. in Macoun's Cat. Can. Pl., **2**: 242.

This is *Triticum glaucum* and *Agropyron glaucum* of American authors, not R. & S. Closely related to *A. pseudorepens*, from which it may be distinguished by its rigid, striate-nerved, glaucous and bluish-green leaves, and its yellowish, broader, and more compressed spikelets.—Type in the Engelmann herbarium collected by Geyer, "Upper Missouri."

Common on the prairies and high plains from Minnesota and Manitoba to Missouri and Texas, westward to Utah and eastern Oregon. Specimens from Colorado, Nebraska, and Kansas often have two spikelets at each node; forms with pedicellate spikelets and racemose-spicate forms rarely occur.

Agropyron spicatum palmeri Scribn. & Smith, var. nov. Culms robust, clothed at the base with papery leaf sheaths, the whole plant sparsely or densely strigose-pubescent, spikelets more closely appressed.

Mountains of Arizona and New Mexico. Specimens in the National Herbarium from Arizona: Palmer, 1869, without locality, and 563, June, 1890, Willow Spring; 3192 Lemmon, 1884, San Francisco Mountains. New Mexico: 35 Rothrock, June, 1875, Santa Fe, and 103, July, 1874, Agua Azule; altitude, 6,500 feet.

Agropyron spicatum molle Scribn. & Smith, var. nov. Like the species, but the empty and flowering glumes and the rachis more or less villose-pubescent. This is *Agropyron glaucum* of many collectors and *A. glaucum pubiflorum* Vasey, in part.

The Saskatchewan to Colorado and New Mexico, and westward to Idaho and Washington, but not so abundant as the species.

— — *Spikelets erect, narrow, subcompressed or nearly cylindrical.*

= *Flowering glumes densely pubescent or lanate.*

Agropyron dasystachyum Scribn. Bull. Torr. Bot. Club **10**: 78; *Triticum repens dasystachyum* Hook., Fl. Bor. Am., **2**: 254; *T. dasystachyum* A. Gray, Manual, 602 (1848).

Sand hills and dunes from Manitoba to Michigan. Specimens in the National Herbarium from Manitoba: 109, 710 J. Macoun, 1879. Wisconsin: Lapham. Michigan: 56 and 155 Schuette, 1887; Wheeler, 1895.

Agropyron dasystachyum subvillosum Scribn. & Smith, n. n. More slender, less glaucous, the innovations one-fourth to one-third as long as the culms; spike

shorter and more crowded, narrow, mostly fewer-flowered. Spikelets shorter, more compressed; empty glumes ovate-lanceolate, acuminate or simply acute, one-third as long as the spikelet; flowering glumes 3 to 5 lines long, obtuse or acute, pubescent or lanate.—*Triticum repens subvillosum* Hook., Fl. Bor. Am., **2**: 254; *A. dasystachyum*, collectors, in part.

From the Saskatchewan to Washington, Nevada, and Colorado. Specimens in the National Herbarium from Washington: Vasey, 1889; 2137, 2171 Henderson, 1892; 310 Sandberg and Leiberg, 1893. Idaho: 2341 Rydberg, 1895. Utah: 230 Ward, 1875. Colorado: 15 Patterson, 1885; 631 Shear, 1895. Wyoming: 621 Tweedy, 1885. Montana; 587 Williams, 1890; 549 Shear, 1895; 2130 Rydberg, 1895. Manitoba: 111 J. Macoun, 1879.

= = Flowering glumes smooth or merely scabrous.

1. *Leaves becoming involute, strigose-pubescent above; spikelets subdistant.*

Agropyron lanceolatum Scribn. & Smith, sp. nov. Pale yellowish-green or glaucous, 2 to 3 feet high, with long flat leaves, becoming involute when dry, and narrow, erect, or flexuose spikes of rather large subcompressed, acute spikelets. Culms terete, smooth and shining below, striate above, clothed at the base with papery leaf sheaths; nodes brown or black; sheaths somewhat inflated, shorter than the internodes, the lower finely pubescent, the upper smooth and glaucous; ligule very short, membranaceous; leaf blades linear, acuminate and pungently pointed, 5 to 12 inches long, about 2 lines wide, flat, scabrous on the back and margins, pubescent or thinly hirsute above, the uppermost culm leaf very short. Spike 4 to 6 inches long. Spikelets 5 to 10 lines long, 4- to 7-flowered, erect; empty glumes much shorter than the spikelets, unequal, narrowly lanceolate or oblanceolate, acuminate, 3 to 4½ lines long, 3- to 5-nerved, scabrous on the nerves; flowering glumes 4 to 7 lines long, broadly lanceolate, acute, mucronate, truncate or bidentate, rounded on the back, more or less pubescent, 3-nerved and scabrous toward the apex; palea nearly equaling its glume; internodes of the rachilla short, obconical, pubescent.—*Triticum junceum* Hook. Fl. Bor. Am., **2**: 254, not Linn.; *A. glaucum pubiflorum* Vasey, in part. Closely related to *Agropyron spicatum*, from which it is readily distinguished by its short and acute empty glumes, lanceolate acute spikelets, and less crowded spike.

Idaho to Washington and Oregon. Specimens in the National Herbarium from Idaho: 266, 267 E. Palmer, 1893; 2341 Rydberg, 1895. Oregon: 1133 Cusick; 269, 302 Leiberg, 1894, Crook County. Washington: Vasey, 1889; Sandberg and Leiberg, 1893; and Suksdorf as follows: 18 (1882), distributed as *Triticum repens acutum* Vasey; 179 (1885), distributed as *A. repens* var.; 222, 914 (1886), distributed as *A. glaucum pubiflorum* Vasey.

2. *Leaves becoming involute, scabrous throughout, spikelets crowded.*

× *Empty glumes about as long as the spikelet.*

Agropyron pseudorepens Scribn. & Smith, sp. nov. An indigenous perennial with creeping rootstocks, light-green leaves, scabrous on both sides, and narrowly lanceolate erect spikelets in an elongated spike. Culms 1 to 3 feet high, ascending or erect from a geniculate base, striate, glabrous, or scabrous below the nodes, with 3 or 4 culm leaves. Leaf sheaths striate, glabrous, shorter than the internodes; ligule membranous, 1 line long or less; blades linear, long-attenuate pointed, scabrous throughout, 5 to 8 inches long, 1 to 3 lines wide, prominently striate-nerved, involute when dry. Innovations half the length of the culm. Spikes 4 to 8 inches long. Spikelets 5 to 8 lines long, erect and appressed before and after flowering, linear-lanceolate, acute, compressed, 3- to 7-flowered, subdistant; empty glumes linear-lanceolate, nearly equal, acuminate or awn-pointed, 5-nerved, a little shorter than or equaling the spikelet, scabrous on the nerves

and scarious on the margins; flowering glumes linear-oblong, acuminate or awn-pointed, rounded on the back, 5-nerved, scabrous; palea shorter than its glume; internodes of the rachilla short, minutely scabrous.

This is *Agropyron repens* of most American collectors and manuals, but not of Linnæus. The latter is European, and is not found indigenous in this country except along the New England coast. *A. pseudorepens* may be distinguished by the harsher leaves, which are scabrous on *both* sides, more prominently nerved, and involute when dry; the longer, narrower, and more rigid leaves of the innovations, and narrower and more erect spikelets; the flowering glumes very rarely awned.

Texas and Arizona to Nebraska, Montana, and British Columbia. Specimens in the National Herbarium from Texas; Nealley, 1889. Arizona: 3193 Lemmon, 1881. Colorado: G. H. French, Lake Ranch, 1874, *Triticum repens compactum* Vasey, in part, and *Triticum repens acutum* Vasey, in part; 1166 J. Wolfe, 1873; 437 M. E. Jones, 1878, *Triticum repens acutum* Vasey, in part; 120 C. S. Crandall, July, 1890; 15 Patterson, 1885; 2488 Rydberg, 1895; 621, 649, 733 Shear, August, 1895. Wyoming: B. W. Evermann, Casper, 1893; 224 J. N. Rose, Yellowstone Park, 1893. Nebraska: 110, 111, H. J. Webber, 1889: 2603 Clements, June, 1893; 272 Shear, Kearney, 1895; 2018 Rydberg, Kearney, 1895. South Dakota: Geyer, 1839. North Dakota, Seymour, 1884. Minnesota: F. L. Wood, July, 1889. Ontario: John Macoun, July, 1884. British Columbia: 10 John Macoun, 1890, Deer Park. Montana: 424 F. L. Scribner, 1893; L. F. Ward, 1885; 340, 383, 411, 440 Shear, 1895; 2088 Rydberg, 1895. Nevada: 236, S. M. Tracy, 1887. Washington: 2134 Henderson, July, 1892; 1910, Piper, July, 1894.

Agropyron pseudorepens magnum Scribn. & Smith, var. nov. Robust, 3 to 4 feet high; leaves 8 to 12 inches long; spikes 6 to 8 inches long, one-sided; spikelets crowded, acute, 1 inch long.

Type specimen collected by P. A. Rydberg, 2401, Enterprise, Colo., August 19, 1895; also by Sandberg, Leiberg, and MacDougal, 556, south shore of Lake Coeur d'Alene, Idaho, July 5, 1892. Possibly a good species.

× × *Empty glumes less than one-half as long as the spikelets.*

Agropyron riparium Scribn. & Smith, sp. nov. Glaucous, tufted, 1½ to 2 feet high, with narrowly involute leaves and pubescent leaf sheaths, short crowded spikes, and 3-nerved empty glumes. Culms terete, striate, glabrous, erect from a somewhat geniculate base; sheaths striate, much shorter than the internodes, the upper glabrous, the lower minutely pubescent; ligule very short, membranous; leaf blades linear, long-attenuate pointed, flat, becoming involute, 2 to 6 inches long, 2 lines wide or less, striate, scabrous throughout. Spike 2½ to 4 inches long, of 8 to 15 rather crowded 5- to 7-flowered, compressed, and spreading spikelets which are 5 to 6 lines long; empty glumes oblong-linear, acute, 3-nerved, 2 lines long; flowering glume oblong-lanceolate, acute, glaucous, rounded on the back, scabrous toward the apex; palea shorter than its glume; internodes of the rachilla glabrous, flattened, about 1 line long.

River banks, Montana, June and July. Founded on specimens collected in 1895 by P. A. Rydberg, 2127, Garrison; C. L. Shear, 369, Garrison, and 372, Deer Lodge.

3. *Leaves flat, smooth on the back, pilose on the nerves above, spikelets crowded.*

Agropyron repens Beauv., Agrost., p. 102. A pernicious weed which has been extensively naturalized throughout the United States. The introduced *A. repens* may be distinguished from the indigenous *A. pseudorepens* by its flat green leaves, which are glabrous on the back, scabrous and sparsely hirsute along the nerves above; distichous spikes and green spikelets; lanceolate-acuminate glumes; and short smooth internodes of the rachilla.

Represented in the National Herbarium by specimens from Maine to Vancouver Island, and Virginia to Missouri.

Agropyron repens pilosum Scribn. Rachis of the spike pubescent to hirsute; flowering glumes awnless or short cuspidate-pointed.—Scribn. in Fl. Mt. Des. Isl., 183 (1894); Chelsea Beach, Mass., W. Boott, July 15, 1868, in Herb. Gray; and Mount Desert Island, Maine.

Agropyron repens littoreum Anders. An erect purplish-green perennial with rigid, reddish-green glaucous leaves, the lowest culm leaves and the basal sheaths hirsute, the empty and flowering glumes awn-pointed.—Salt marshes, Cape Elizabeth, Me. Collected by E. Tuckerman in 1860, and F. Lamson-Scribner in July, 1895. This form is common to the coast of New England and northern Europe.

The following European varieties may occur in this country:

Agropyron repens agreste Anders. Spike crowded, dull green with crowded spikelets; empty glumes acute; flowering glume awnless or mucronate or cuspidate; leaves hirsute (above). In barren fields.

Agropyron repens nemorale Anders. Spike remotely flowered, bright green, spikelets narrow; empty glumes linear acute; flowering glumes long-awned; leaves scabrous above or more sparingly hirsute, broader and more luxuriant. In meadows and moist woodlands. All of these are exceedingly variable.

VI. MISCELLANEOUS NOTES AND DESCRIPTIONS OF NEW SPECIES.

Paspalum scabrum Scribn., sp. nov.

Culms 16 inches to 2 feet long, branched below, and geniculate at the lower nodes, striate and downwardly scabrous along the striæ, nodes densely appressed-pubescent, hairs directed downward; sheaths loose, mostly exceeding the internodes, striate, strongly retrorse-scabrous; ligule membranous, about 1 line long, margin fimbriate; leaf blades 2 to 4 inches long, one-half to nearly 1 inch wide, lanceolate, abruptly contracted at the base, acute, rather densely papillate pilose on both surfaces, especially beneath, the narrow portion connecting the blade with the sheath pubescent, margins and mid-nerve ciliate-scabrous. Panicle about 6 inches long, the common axis strongly striate and scabrous; racemes 30 to 50, subfasciculate, about 1 inch long, shortly pedicellate, pedicel dark brown, pubescent; axis of racemes about 1 line wide, flat, or when dry partly folded about the spikelets, very thin, nerved, rough-scabrous along the nerves, especially the stronger middle one produced beyond the spikelets and mucronate pointed. Spikelets uniseriate on the very short pubescent pedicels, oblong, obtuse, a little less than 1 line long, white; first glume wanting; second glume very thin, sub-hyaline, 3-nerved, a little longer and broader than the smooth and shining flowering glume.

Allied to *Paspalum mucronatum* Muhl., from which it is distinguished by its retrorsely scabrous culms and sheaths, shorter racemes, uniseriate and glabrous spikelets, and in the absence of the first glume. Also allied to *Paspalum gracile* Rudge, but this has smooth culms, sheaths and leaves, rather longer racemes, and larger spikelets, which are nearly 1¼ lines long.

Guatemala, No. 3903 Heyde & Lux, 1892.

Ichnanthus lanceolatus Scribn. & Smith, sp. nov.

An erect or ascending, cæspitose, branching perennial 1 to 2 feet high, with lanceolate leaves and simple panicles of few loosely flowered racemes. Sheaths shorter than the internodes, ciliate along the margins, otherwise smooth, or the lowermost pubescent; ligule a short ciliate fringe of hairs; leaf blade 1 to 3 inches long, one-fourth to one-half inch wide, lanceolate acute, smooth, many-nerved, with a narrow, cartilaginous margin, abruptly narrowed at the base, this contraction forming in the lower leaves, especially those of the sterile shoots, a slender channeled petiole, which, like the sheaths, is ciliate along the margins. Panicle branches erect or ascending (spreading in anthesis), 1 to 2 inches long, the uppermost

shorter. Spikelets in pairs, one sub-sessile, the other raised on a pedicel about as long as itself. Spikelets ovate-lanceolate, acute, glabrous, about 2 lines long; first glume ovate, acute, strongly 3-nerved, one-half to three-fourths the length of the spikelet, scabrous on the mid-nerve above; second glume ovate-lanceolate, acuminate, 5-nerved, nearly clasping the similar empty third glume; base of the fourth glume surrounded by the third; fourth glume about 1½ lines long, oblong-lanceolate, obtuse, 5-nerved, very smooth and closely rolled about the palea, which is of similar texture.—"Old fields about Izamal, No. 854. George F. Gaumer, September, 1895." Yucatan. *nom. vulg.*, "Xkanchim."

18862 **Triodia drummondii** Scribn. & Kearney, sp. nov.

A rather slender, erect perennial, 3 to 4 feet high from strong, scaly rootstocks, with long (8 to 16 inches) radical leaves, and contracted panicles 6 to 8 inches long. Culms simple, naked above, smooth; nodes 2 to 4, dark purple; sheaths of the basal leaves crowded, somewhat compressed, closely imbricated, sparsely to densely pilose, with long white hairs; upper leaf sheaths shorter than the internodes, glabrous or pilose at the throat; ligule a dense fringe of very short white hairs; blades of the radical leaves about 2½ lines wide, attenuate, acuminate and involute toward the apex, shortly pilose below near the base; uppermost cauline leaf 1½ inches long or less. Panicle somewhat drooping, simple, the appressed rays solitary, the lowermost 1 to 2 inches long, slightly glandular, but not villose, in the axils. Spikelets 4 to 5 lines long, usually 3-flowered; outer glumes ovate-acute, 1-nerved, whitish or purplish, except the prominent nerve, 2 to 2½ lines long, subequal; third or flowering glume 2½ to 3 lines long, ovate-lanceolate, bifid, 3-nerved, the nerves extending into short, awn-like teeth, the central one equaling or a little exceeding the narrow obtuse lobes of the glume, nerves ciliate in the lower half with rather long, erect, white hairs; palea slightly shorter or a little longer than the glume, oblanceolate, obtuse, minutely ciliolate along the keels toward the apex.

Jacksonville, Fla. (Drummond); Aiken, S. C. (Ravenel); Biloxi, Miss., growing in dry soil in low pine barrens (324 Kearney, 1896). There is also a specimen in the National Herbarium from Georgia, without locality.

Allied to *Triodia sesleroides*, but distinguished by its scaly rootstocks (resembling those of *Panicum anceps*), pilose sheaths, contracted, simple panicles, and larger, usually fewer-flowered, spikelets.

35718 **Elymus robustus** Scribn. & Smith, sp. nov.

Stout, erect caespitose perennials 3 to 6 feet high, with leafy culms and a stout bearded spike. Culms cylindrical, smooth and shining, 2 to 3 lines thick; nodes glabrous; sheaths finely striate, glabrous or minutely retrorsely scabrous between the nerves, scarious on the margins, open at the throat, exceeding the internodes; ligule very short, coriaceous, entire, with short acute lateral auricles; blades constricted at the base, striate, rigid, coriaceous, linear-lanceolate, attenuate to the pungently pointed apex, 4 to 10 lines wide, 9 to 15 inches long, strongly scabrous on both sides and on the margin; spike shortly exserted from the uppermost leaf sheath, cylindrical, erect, 5 to 7 inches long, 1 to 2 inches in diameter; rachis compressed, smooth, and glabrous except on the scabrous angles; spikelets in threes or fours, 3- to 4-flowered; empty glumes 5 to 6 lines long, linear, subulate, rigid, erect, 2- to 5-nerved, tipped with an awn twice as long; flowering glumes 6 to 8 lines long, narrowly linear-lanceolate, attenuate above, dorsally compressed, elevated on a short stipe, 5-nerved above the middle, minutely scabrous, or pubescent, bifid at the apex and awned from between the setaceous teeth with a stout straight or curving scabrous awn 1½ to 2 inches long; palea 1 line shorter than its glume, linear, acute, broadly sulcate, bicarinate, scabrous on the keels above.

Has been regarded a variety of *E. canadensis* Linn.

Specimens examined from Illinois, Iowa, Kansas, and Montana.

3725 1

Elymus intermedius Scribn. & Smith, sp. nov.

Culms rather stout, erect from a perennial root; leafy, terete, glabrous, 2 to 3 feet high; sheaths striate, glabrous, longer than the internodes, the uppermost somewhat inflated; ligule almost obsolete; leaves linear, erect, attenuate to the filiform or acuminate apex, scabrous throughout, 4 to 7 inches long, 2 to 3 lines wide. Spike slender, erect, 2½ to 4 inches long, cylindrical, barely exserted from the upper leaf-sheath, the rachis pubescent; spikelets mostly in twos or rarely threes, erect; empty glumes linear-lanceolate, or linear, thickened and coriaceous at the base, 3- to 5-nerved above, hirsute, 5 lines long, 1 to 1½ lines wide, tipped with a scabrous awn shorter than or about as long as the glume; flowering glume on a short stipe, lanceolate, acute, 5-nerved, hirsute-pubescent, 4 to 4½ lines long, tipped with a slender, scabrous awn 7 to 8 lines long; palea a little shorter than its glume, hispid on the keels above the middle, obtuse or retuse; grain adherent to both flowering glume and palea, 2½ lines long, dorsally compressed, sulcate next the palea, acute at the base, rounded and hispid at the apex; hilum extending the full length of the grain. Distinguished from *E. canadensis* by its erect spikes and wider, short-awned empty glumes; from *E. virginicus* by its straighter empty glumes, less strongly thickened at the base, and by its hirsute spikelets. From Maine to Virginia, west to Illinois and Nebraska.

1096 1

Elymus angustus Trin. in Ledb. Fl. Alt., I, 119.

A rather rigid, erect, cæspitose grass 1½ to 3 feet high, with flat leaves and minutely pubescent spikes 4 to 7 inches long. Culms cæspitose, striate, smooth, somewhat geniculate at the lower nodes; sheaths about equaling the internodes, smooth, glaucous, open at the throat, the uppermost somewhat inflated; ligule membranous, very short, leaf blades rigid, linear, 3 to 6 inches long, 1½ to 3 lines wide, smooth below, scabrous above and along the involute margins, attenuate to the pungently pointed apex. Spikes rather slender, their bases inclosed in the uppermost leaf sheaths finally exserted; rachis pubescent. Spikelets in pairs, 2- to 3-flowered, erect appressed, pubescent; empty glumes subulate from a narrowly lanceolate base, awn-pointed, scabrous, 6 lines long; flowering glumes lanceolate acuminate, compressed on the back below, 4 to 5 lines long, tipped with straight scabrous awns 2 to 3 lines long; palea shorter than the glume, minutely bidentate. This plant agrees so well with typical specimens in the National Herbarium that we have no hesitation in referring it to that species.

Related to *E. dasystachys* Trin. Spikelets fewer-flowered and awns longer.

Wyoming, along the banks of Green River. No. 284 C. L. Shear, June 25, 1895. This seems to be the first time that this species has been collected within our territory.

CHÆTOCHLOA Scribn., nom. nov. *Setaria* Beauv. *Chamæraphis* Kuntze in part, not R. Br. *Ixophorus* Nash, not Schlecht.

The name *Setaria*, which has been taken up by many botanists for a number of well-known weedy grasses with dense, spike-like, bristly panicles, was first applied by Beauvois (in Oware and Benin.) to a species of *Pennisetum*. At an earlier date the name was employed by Acharius to designate a genus of lichens. According to all rules of botanical nomenclature, this last fact renders the name untenable for designating a genus of flowering plants; and were this not the case, its first application to a species of *Pennisetum* placed it at once among the synonyms, which, according to recent rulings, would debar its further use. Some botanists have referred the grasses in question to the genus *Panicum*, from the species of which they differ only in the presence of setæ issuing from the pedicels of the spikelets below their articulation. It is this character, combined with their inflorescence, which led them to be separated from *Panicum*, in which genus the earlier-described species

were first placed. The taking up of the name *Chamaraphis*, a genus established by R. Brown upon certain Australian and south Asiatic grasses having spikelets like those of *Panicum*, but with the partial rachis of the inflorescence produced into long awn-like points beyond the insertion of the upper or only spikelet, appears to have been ill advised, and the more recent adoption of *Ixophorus* for *Setaria* is equally so. The latter genus, *Ixophorus*, possesses well-marked characters of generic value for distinguishing it, and the same is true of *Chamaeraphis*. Neither of these names can be taken up for *Setaria*, unless they are used in a very broad sense to include all the species of *Panicum* thrown by Steudel into the section *Setaria*—that is, those species, as Schlechtendal states it, having *spiculæ in axibus inflorescentiæ varie evolutis pedicellatæ sessilesve, axium sterilium, setas amulantium majore minorere copia cum spiculis nascente*. This would bring together a heterogeneous assemblage of species, the natural result of the adoption of too artificial characters, which, with our present ideas of genera, would be much more easily and more systematically treated if divided into genera upon more natural and genetic characters. While our *Setarias*, so called, might under a broad conception of the genus *Panicum* be referred to it, they seem to form a well-marked group, as indicated by the characters noted above, which it seems best to maintain as a genus, under the new name *Chætochloa*, *Chamaraphis* and *Ixophorus* being both well-defined genera and abundantly distinct. Among the species belonging to this genus are the following: *Chaetochloa verticillata* (L.) Scribn., n. n. (*Panicum verticillatum* Linn.); *C. glauca* (L.) Scribn., n. n. (*Panicum glaucum* Linn.); *C. viridis* (L.) Scribn., n. n. (*Panicum viride* Linn.); *C. italica* (L.) Scribn., n. n. (*Panicum italicum* L.); *C. imberbis* (Poir.) Scribn., n. n. (*Panicum imberbe* Poir.); *C. grisebachii* (Fourn.) Scribn., n. n. (*Setaria grisebachii* Fourn., *Setaria pauciseta* Vasey in part); *C. flava* (Nees) Scribn., n. n. (*Panicum flavum* Nees); *C. penicillata* (Willd.) Scribn., n. n. (*Panicum penicillatum* Willd.); *C. setosa* (Swz.) Scribn., n. n. (*Panicum setosum* Swartz); *C. magna* (Griseb.) Scribn., n. n. (*Setaria magna* Griseb.); *C. composita* (HBK.) Scribn. n. n. (*Setaria composita* HBK.); *C. corrugata* (Ell.) Scribn., n. n. (*Setaria corrugata* Ell.).

EXPLANATION OF PLATES.

PLATE I.—*Ixophorus unisetus: a*, a portion of the rachis of one of the racemes; *b*, a spikelet showing back of the first and third glumes; *c*, a spikelet showing the many-nerved second glume; *d*, fourth or flowering glume seen from the back with the projecting styles and stigmas; *e*, spikelet in fruit, showing the first and third glumes and the broad wing-like margins of the palea of the third glume; *f*, the same as *e*, seen from the other side; *g*, dorsal view of the fourth glume in fruit.

PLATE II.—*Ixophorus pringlei: a*, mature spikelet showing dorsal views of the first and third glumes and the broad wing-like expansions (a^1) of the palea of the third glume; *b*, the same seen from the other side; *c*, palea of the third glume at maturity; *d*, dorsal view of fourth glume.

PLATE III.—*Paspalum scabriusculum: a*, a portion of the axis of one of the racemes bearing six spikelets; *b*, a spikelet showing back of the second or flowering glume; *c*, spikelet showing back of the empty glume; *d*, the empty glume.

PLATE IV.—*Panicum biglandulare: a*, spikelet seen from the side; *b*, the same, showing the first and third glumes, upon the latter the two glands are indicated; *c*, dorsal view of the fourth glume; *d*, anterior view of the same, showing the palea partly surrounded by the glume, and the stigmas.

PLATE V.—*Ichnanthus lanceolatus: a*, spikelet from the side; *b*, spikelet showing base of the first and back of the third glumes; *c*, fourth or flowering glume; *d*, spikelet with the first glume removed, the third glume partly inclosed by the second; *f*, base of flowering glume.

IXOPHORUS UNISETUS.

IXOPHORUS PRINGLEI.

PASPALUM SCABRIUSCULUM.

PANICUM BIGLANDULARE.

ICHNANTHUS LANCEOLATUS.

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[Synonyms are in *italic*, valid species in roman, and new names or new species in antique type.]

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BULLETIN No. 5.

U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF AGROSTOLOGY.

(Grass and Forage Plant Investigations.)

A REPORT

UPON THE

GRASSES AND FORAGE PLANTS

OF THE

ROCKY MOUNTAIN REGION.

BY

P. A RYDBERG AND C. L. SHEAR.

PREPARED UNDER THE DIRECTION OF THE AGROSTOLOGIST.

WASHINGTON:

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF AGROSTOLOGY,
Washington, D. C., November 20, 1896.

SIR: I transmit herewith for publication as Bulletin No. 5 of this division a report upon the work done in the field by Messrs. P. A. Rydberg and C. L. Shear in 1895, together with an enumeration of the plants collected by them.

Respectfully,

F. LAMSON-SCRIBNER,
Agrostologist.

CHAS. W. DABNEY, Jr.,
Assistant Secretary.

INTRODUCTION.

In June, 1895, Messrs. P. A. Rydberg and C. L. Shear were commissioned by the Secretary of Agriculture, for three months, as field agents to visit certain points in Nebraska, Idaho, Montana, Utah, and Colorado. They were instructed to collect live roots of grasses, grass seeds, and sheaves of all the species observed. They were also instructed to collect three sets of herbarium specimens of all the native grasses and forage plants found, and to gather all the information possible from stockmen and farmers relative to any and all the plants which are held to be especially valuable during drought, and also to make observations relative to the abundance and apparent value of the various grass species and the value of the regions visited for grazing or for the production of hay. The collections made by Messrs. Rydberg and Shear under these instructions were large and extremely valuable, the herbarium specimens and sheaves particularly so. Owing to the extent of territory covered and the time which it was possible to devote to actual field work, the collection of seeds was not so large as it might otherwise have been. The number of herbarium specimens amounted to over 4,000, among which was a new species of oat grass, which has been named, in honor of the Secretary of Agriculture, *Avena mortoniana*. The field notes and general observations made by Messrs. Rydberg and Shear are embodied in the following report, presented by them at the close of their season's work. To this report is appended a classified list of the grasses and forage plants collected, giving the locality and date of collection of each species. Sets of these grasses have been distributed under the numbers designated in the list, and the list will be of value to botanists in working upon the geographical distribution of plants. There will doubtless be some modifications in the names of the species of *Poa* and *Festuca* when these genera come to be more critically studied, but the determinations have been made with great care and are as exact as our present knowledge of grasses will permit. The regions visited by the agents are of particular interest to farmers, and especially to stock raisers, and any addition to the knowledge of the grasses and forage resources of this section of our country can not fail to be of value to those engaged in these pursuits.

Experiments in the cultivation of native grasses of which seeds were obtained are being made, and important and valuable results are looked for in this work. Some of the species are of particular promise, indicating productiveness and excellent quality for hay or pasturage.

Thanks are due Prof. L. H. Bailey for determining the *Carices*, to Dr. N. L. Britton for determining the other *Cyperaceæ*, to Mr. F. V. Coville for determining the *Juncaceæ*, and to Mr. C. L. Pollard for determining the *Leguminosæ*.

F. Lamson-Scribner.

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A REPORT UPON THE GRASSES AND FORAGE PLANTS OF THE ROCKY MOUNTAIN REGION.

By P. A. RYDBERG and C. L. SHEAR.

FIELD NOTES AND GENERAL OBSERVATIONS.

MONTANA.

Our observations and collections made in Montana were limited to the Beaver Head, Big Hole, Deer Lodge, Gallatin, Madison, and upper Missouri valleys.

BEAVER HEAD VALLEY.

In this valley we visited three places—Lima, Red Rock, and Dillon. At Lima the valley is about 5 miles wide. It is mostly dry, except along the Beaver Head Creek and in small areas here and there irrigated in a very primitive fashion from springs among the mountains and foothills. Very little is under cultivation, but there is much good land available for that purpose, and much could be irrigated if all the water at hand were properly used. Most of the valley is used for pasture, but on account of the dryness the grass is scanty and poor. The most common grasses were *Agropyron spicatum* S. & S., *Agropyron divergens* Nees (fig. 1), *Poa buckleyana* Nash, and *Koeleria cristata* Pers. A sedge (*Carex filifolia*) is also very common. East of the town, along the tributaries of Beaver Head Creek, there were some fair meadows. The principal grasses were *Calamagrostis neglecta* Gærtn. (fig. 2), a species of *Poa* (near *P. fendleriana*) and *Deschampsia cæspitosa* Beauv.

FIG. 1.—Wire Bunch-grass (*Agropyron divergens*).

The lands most valuable for grazing were the foothills and mountain sides, on account of the moisture from the melting snows which still remained on the higher slopes and peaks in the early part of August. The most valuable

grass here seemed to be a form of *Festuca orina* L. In the canyons several species of *Poa* are common, and afford valuable grazing.

At Red Rock the valley is narrower and somewhat drier, there being no high mountains in the vicinity to furnish moisture as at Lima. Only along the creek was there a good growth of grass. Near the station there was a fine meadow, the principal grass of which was a Blue-grass (*Poa* species), valuable for hay and pasturage.

At Dillon a much larger portion of the valley was under cultivation and irrigation, and some fine meadows of native and cultivated grasses were to be seen. Among the native species were *Elymus triticoides* Nutt., *Stipa comata* Trin. & Rupr., *Spartina gracilis* Trin., *Agropyron pseudorepens* S. & S., *Phalaris arundinacea* L., and *Calamagrostis neglecta* Gærtn.

FIG. 2.—Pony-grass (*Calamagrostis neglecta*).

BIG HOLE VALLEY.

The widest part of this valley, at least along the railroad, is at Melrose, where we were July 5–8 and August 1. On both sides of the river and along its tributaries we found good meadows.

The chief grasses were *Poa pratensis* L., *Poa nevadensis* Vasey, *Agrostis alba* L., *Koeleria cristata* Pers., and *Calamagrostis neglecta* Gærtn. In the drier parts of the valley we also found *Bouteloua oligostachya* Torr. rather common. The hills were quite barren, scattered specimens of *Agropyron divergens* Nees, *Eriocoma cuspidata* Nutt. and *Stipa comata* Trin. & Rupr. being most common.

FIG. 3.—Slough-grass (*Beckmannia erucæformis*).

DEER LODGE VALLEY.

Near Silver Bow the valley is dry and barren, but toward the hills to the west, there were some meadows watered by mountain brooks. The principal grasses, which made quite an amount of hay in places, were *Deschampsia cæspitosa* Beauv., *Festuca scabrella* Torr., *Festuca rubra* L., and *Koeleria cristata* Pers.

Farther north the valley widens, so that at Anaconda it is several miles wide. From here to Deer Lodge it is well under cultivation and fine farms occur all along the road. At Deer Lodge there are good meadow lands, the chief grasses being *Festuca rubra* L., *Poa buckleyana* Nash., *Poa pratensis* L., *Agropyron spicatum* S. & S., *Beckmannia erucæformis* Host. (fig. 3), *Bromus breviaristatus* Buckl., *Calamagrostis*

neglecta Gærtn., and several *Carices*. At Garrison the valley is very narrow, and nothing of interest was found excepting a few specimens of *Stipa richardsoni* Link.

THE UPPER MISSOURI AND MADISON VALLEYS.

These valleys may be treated here as one, the Madison being a direct continuation of the Missouri Valley. About Helena there are no natural meadows of any account. All the land under cultivation is irrigated and used chiefly by the Chinese for vegetable gardening. Most of the grasses procured were growing along streams and irrigation ditches, as the bench lands and foothills were almost destitute of forage at the time of our visit because of the dryness. The following were the most common of those noticed: *Elymus condensatus* Presl, *Agrostis alba* L., *Agropyron pseudorepens* S. & S., *Agropyron spicatum* S. & S. (fig. 4), *Puccinellia airoides* Wats. & Coult., and *Poa compressa* L.

Along the Madison and Missouri rivers there are broad valleys, the bottom lands of which are covered with the native grasses in many places, producing large crops of hay. At Townsend, in the Missouri Valley, the following grasses were most abundant: *Calamagrostis canadensis* Beauv., *Agropyron spicatum* S. & S., *Agropyron tenerum* Vasey, *Phalaris arundinacea* L., *Elymus macounii* Vasey, *Beckmannia eruciformis* Host., *Agrostis asperifolia* Trin., *Spartina gracilis* Trin., and several *Poas*.

FIG. 4.—Colorado Blue-stem (*Agropyron spicatum*).

We stopped only at one place on the Madison River, about 12 miles from its junction with the Jefferson. Here were some of the best natural meadows that we saw in Montana. The native grasses grew luxuriantly and formed a large bulk of hay which the farmers regarded as of excellent quality. The principal species were *Elymus macounii* Vasey, *Calamagrostis inexpansa* A. Gray, *Calamagrostis canadensis* Beauv., *Calamagrostis americana* Scribn., *Eatonia pennsylvanica* A. Gray, *Spartina cynosuroides* Willd., *Sporobolus asperifolius*, and *Phalaris arundinacea* L.

GALLATIN VALLEY.

The Gallatin River empties into the Missouri a few miles below the junction of the Madison and Jefferson, and here the Gallatin Valley

broadens and becomes a part of the Missouri Valley, partaking of its character and flora. Farther up the river the valley consists of bottom lands, sometimes of considerable extent, forming natural meadows from which the bulk of the hay is obtained, and bench lands constituting the greater portion of the valley. These bench lands are under cultivation, being well irrigated by water from the Gallatin and its branches. The native grasses of the "benches" are principally Blue Grama, *Bouteloua oligostachya* Torr. (fig. 5), *Poa buckleyana* Nash, and the Sheep Fescue, *Festuca ovina* L. In an oat field near Manhattan there was fully as much *Eriocoma cuspidata* Nuttall, as oats, and a neglected field close by was completely covered with the same grass. A field of potatoes was also overrun with it. In sandy soil similar to that of the bench lands there seems to be danger of this grass becoming a bad weed. The chief grasses of the river bottoms were *Agrostis scabra* Willd., *Agropyron pseudorepens* S. & S., *Koeleria cristata* Pers., *Agropyron caninum* R. & S., *Calamagrostis canadensis* Beauv., *Calamagrostis inexpansa* A. Gray, *Deschampsia cæspitosa* Beauv., *Bromus cilatus* L., *Spartina gracilis* Trin., and *Eatonia pennsylvanica* A. Gray.

FIG. 5.—Blue Grama (*Bouteloua oligostachya*).

At Bozeman the valley is under good cultivation and the foothills and mountain sides furnish excellent pasturage. The most important grasses in such situations, besides the grama and bunch grasses, are *Agropyron divergens* Nees, *Trisetum subspicatum* P. B., *Bromus breviaristatus* Buckl. (fig. 6), and *Danthonia californica* Boland. The most common grasses of the mountain meadows and in the canyons are *Melica subulata* Scribn., *Melica spectabilis* Scribn., *Melica bulbosa* Geyer, *Phleum alpinum* L., *Deschampsia elongata* Munro, *Festuca jonesii* Vasey, *Poa nemoralis* L., and *Poa wheeleri* Vasey.

FIG. 6.—Mountain Brome-grass (*Bromus breviaristatus*).

IDAHO.

The only place visited in this State, was Beaver Canyon, which is in the mountains near the continental divide. The character of the flora is chiefly subalpine. There were a few good meadows along the mountain streams; one especially, produced a large crop of excellent hay. The chief grass was *Alopecurus occidentalis* Scribn. There was also a considerable quantity of *Trifolium longipes* Nutt., which added much to the quantity as well as the quality of the hay.

The following grasses were frequent or common in meadows and along streams: *Poa pratensis* L., *Poa wheeleri* Vasey, *Poa nemoralis* L., *Poa buckleyana* Nash, *Calamagrostis suksdorfii* Scribn., *Agropyron caninum* R. & S., *Agropyron spicatum molle* Scribn. & Smith, *Danthonia intermedia* Vasey, *Bromus breviaristatus* Buckl., *Koeleria cristata* Pers., *Agrostis asperifolia* Trin., *Hordeum nodosum* L., and *Festuca ovina* L. Here as elsewhere *Poa buckleyana* and *Festuca ovina* were the chief grazing grasses and constituted the principal part of the pasturage of the sheep ranges in the vicinity.

FIG. 7.—Feather Bunch-grass (*Stipa viridula*).

UTAH.

Only three days were spent in Utah, two at Logan and one at Echo. In the vicinity of the agricultural experiment station at Logan native grasses were not abundant.

Experiments were being carried on with the cultivated varieties of grasses, and we were told that they had once attempted to cultivate one of the "bunch grasses," a species of *Agropyron*, but it was a failure. Instead of producing the tall leafy form of its wild state it was low and stunted. Perhaps this was because it is not the habit of the plant to form a continuous sod, and when compelled to spread out and abandon its bunching habit it lost its thrifty character. This gives a hint, however, as to the necessity of careful experiments in the cultivation of the native species before definite statements can be made as to their value under changed conditions. The following wild species were common: *Trisetum subspicatum* P. B., *Agrostis asperifolia* Trin., *Stipa viridula* Trin. (fig. 7), *Bromus kalmii* A. Gray, and *Avena fatua* L. The last species is looked upon here as a bad weed.

COLORADO.

The larger part of the month of August was spent in Colorado visiting Clear Creek Canyon about Georgetown, Silver Plume, Gray's Peak, and Idaho Springs. Our work was not confined to the canyon and its branches, but much collecting was done on the mountain sides and in a few instances even above timber line.

The canyon is narrow and gives but little place for natural meadows. There is one of some extent, however, just below Georgetown, where the valley is widest. This was mostly used as pasture for the donkeys and village cows. Along Clear Creek were found *Poa flava* Linn., *Beckmannia erucæformis* Host., *Calamagrostis neglecta* Gærtn., *Calamagrostis inexpansa* A. Gray, and *Agrostis alba* L., but most of the grasses consisted of shorter species, as *Sporobolus depauperatus* Scribn., *Bouteloua oligostachya* Torr., *Koeleria cristata* Pers., *Alopecurus occidentalis* Scribn., and *Poa alpina* L. In a valley 3 miles north of Georgetown, near Empire, was found the only meadow we saw that could be used as hay land. The most common species here were *Danthonia parryi* Scribn., *Poa pratensis* L., *Muhlenbergia gracilis* Trin., *Elymus triticoides* Nutt., *Agropyron pseudorepens* S. & S., *A. spicatum molle* Scribn. & Smith, and *Koeleria cristata* Pers. (fig. 8).

FIG. 8.—Prairie June-grass (*Koeleria cristata*).

Hay land is scarce in the region about Georgetown and Silver Plume, but the valleys, canyons, and mountain sides furnish some pasture. The grass flora is especially rich along the mountain brooks. The genus *Poa* is well represented and numerous species, varieties, and forms are met with almost everywhere. Other common grasses are *Agropyron pseudorepens* S. & S., *Calamagrostis canadensis* Beauv., *Calamagrostis purpurascens* R. Br., *Festuca ovina* L. (several forms), *Bromus ciliatus* L., *Bromus ciliatus purgans* A. Gray, *Trisetum montanum* Vasey, *Trisetum subspicatum* P. B., and *Phleum alpinum* L. To these might be added several species of *Carex* which furnish indifferent forage.

In the vicinity of Idaho Springs, which is situated at a considerably lower altitude, we found many of the species just mentioned and several not found in the higher mountains, as, for instance, *Cinna pendula* Trin., *Stipa robusta* Scribn.. *Sitanion elymoides* Rafin., and *Melica parviflora* Scribn.

FOOTHILLS AND PLAINS.

We spent two days at Golden and one day each at Mountain Meadow, Boulder, and La Salle. The first three places are situated at the base of the mountains and the last on the plains. Our collections at the

former places were made partly in the foothills and partly on the plains. The most important grasses of the foothills were the following: *Muhlenbergia racemosa* (Mx.) B. S. P., *Muhlenbergia gracilis* Trin. (fig. 9), *Andropogon scoparius* Mx., and *Andropogon provincialis* Lam., with other common species characteristic of the plains. The plains of Colorado, as well known, are very dry and the vegetation is scanty except where irrigated. The grasses are essentially the same as in western Nebraska.

NEBRASKA.

In this State the following places were visited: Central City, Kearney, and North Platte. At North Platte *Sporobolus airoides* Torr. was very common. Dr. Vasey has reported this as a valuable grass, but this is evidently a mistake, as the species is very tough and wiry and must make very poor hay, while as pasture it is apparently untouched by stock as long as there is anything else to be found. In a large pasture, which had apparently been in use from the opening of the season, every bunch of this grass had been left untouched, while the other grasses were cropped close to the ground.

FIG. 9.—Slender Satin-grass (*Muhlenbergia gracilis*).

GRASSES DESERVING SPECIAL MENTION.

The following species, from what we observed and from what we could learn of farmers and ranchmen, appear to be of most importance in the region visited:

Alopecurus occidentalis Scribn. This grass somewhat resembles timothy, though not so stout. In very wet meadows it grows tall and thick, producing a large quantity of excellent hay. It is a grass well worthy of attention.

Agropyron richardsoni Schrad. In a natural meadow on the river bottom at Manhattan, Mont., a form of this species was very abundant. It was tall and leafy, and grew very thick on the ground, making a large quantity of excellent hay. It impressed us as being a most excellent grass for river bottoms and irrigated land.

Agropyron spicatum Scribn. & Smith. This is generally regarded as being a very good grass. It does not produce as much hay as many species, but is thought to make up in nutritive qualities what it lacks in bulk. It endures dry weather better than many species, and affords good pasture on some of the bench lands.

Agropyron pseudorepens Scribn. & Smith. The plants referred to this species are undoubtedly indigenous in this region, and appear quite different in habit from the European *A. repens* Beauv., introduced into the Eastern States. It spreads little by its rootstocks as compared with the latter. It has been suggested that this is on account of its not occupying broken land, and that when given cultivated ground it would assume the same habit as the other. However this may be, our observations of the plant lead us to believe that this species should be tried under cultivation in the West. Under favorable conditions this grass grows tall and very leafy and without the wiry character of the much-despised "Quack."

FIG. 10.—Early Bunch-grass (*Eatonia obtusata*).

Agrostis asperifolia Trin. There are forms of this plant that vie in abundance and vigor with the last mentioned. They grow in similar situations and are valuable grasses.

Agrostis scabra Willd. Forms of this well-known grass are worthy of more attention in this region. In some low meadows we found it producing abundantly. A grass referred doubtfully to this species was abundant in an irrigated natural meadow at Melrose, Mont., and furnished a large amount of fine hay. The grass seems to be a most excellent one where plenty of moisture can be secured.

Agrostis alba L. In several places more thrifty and luxuriant forms of this species were observed than we had ever noticed before. This was perhaps owing to the peculiar fertility of the soil. However this may be, such forms are worthy of attention and may be taken as starting points for improved varieties.

Bouteloua oligostachya Torr. (See fig. 5.) It is hardly necessary to speak of this well-known species, with whose merits most people are familiar. It is one of the best pasture grasses of the arid plains and bench lands of the West, and far excels, in general opinion, the true Buffalo-grass, *Bulbilis dactyloides* (Nutt.) Rafin., which has gained much of its credit at the expense of *Bouteloua*, the two being often confused by farmers and ranchmen. Under favorable circumstances it produces a much larger crop than is usually supposed.

Calamagrostis canadensis Beauv. Some very excellent forms of this were seen in meadows. It is no doubt a good hay grass.

Calamagrostis inexpansa A. Gray. This species, though not very abundant, seems capable of producing a good quantity of fair hay.

Calamagrostis neglecta Gærtn. A variety of this species was found which seemed capable of producing a fair crop of good hay.

Deschampsia cæspitosa Beauv. In several very wet places we saw forms of this grass which produced a great bulk of hay of fair quality.

Eatonia obtusata A. Gray. (Fig. 10.) This and the next species are generally regarded in the East as of little or no agricultural value, but some forms noticed in meadows in the Gallatin Valley produced quite a bulk of the hay.

Eatonia pennsylvanica A. Gray. In a meadow at Bozeman, Mont., a thrifty form of this is regarded as a fair hay grass. In this connection it is well to note that quite a number of grasses, usually of little or doubtful value in the Eastern States, were here more thrifty, possessing characters which led us to regard them as worthy of attention in this region.

Elymus canadensis L. (Fig. 11.) A prominent sheep raiser in Kearney County, Nebr., says this is a valuable grazing grass in the sand hills. It also makes fair hay if cut before it gets too old.

FIG. 11.—Wild-rye (*Elymus canadensis*).

Elymus triticoides Nutt. This was about the only grass seen among the very arid Alkaline bluffs about Green River, Wyoming. It is a bunch grass and must furnish quite a little forage in such localities.

Festuca ovina L. This grass in its several varieties is the most abundant and perhaps the most valuable one of the foothills. It is considered very nutritious and furnishes the greater part of the winter grazing.

Festuca rubra L. In some places in Montana this is a common species. It frequents moist meadows. At Bozeman it was common in the meadows of the experiment station, and was regarded as a good hay grass.

Festuca scabrella Torr. This is another "Bunch-grass" of great value which is found growing in similar situations as the last, but not so common.

Koeleria cristata Pers. Many of the Montana specimens referred to this species are so different in habit and general appearance from

the ordinary forms of the plains that it is difficult for one to be convinced that they are all the same species. A form growing in the drier parts of a poorly irrigated meadow at Melrose, Mont., especially attracted our attention. It grew very thick on the ground, forming a very dense sod, and reached a height of from 2 to 3 feet, producing a large quantity of excellent hay.

Festuca kingii Scribn. (Fig. 12.) This species, which is a "Bunch-grass," was observed at only one place, Lima, Mont., high up in the foothills at an altitude of between 7,000 and 8,000 feet. It is a very robust species, resembling in habit *Festuca scabrella* and produces a large quantity of good, though rather coarse winter forage. It might prove of value for hay under cultivation in similar localities.

FIG. 12.—King's Fescue (*Festuca kingii*).

Poa lævigata Scribn. We found this grass at only two localities—Green River, Wyoming, and Lima, Mont.—and not common at either place. At Green River it grew in alkaline soil along the river and had the appearance of an excellent grass for agricultural purposes.

Poa wheeleri Vasey (No. 297 Shear). This grass, which was collected in the mountains at Beaver Canyon, Idaho, June 27, seemed to have agricultural value.

Poa nevadensis Vasey. This is another excellent species of much promise for cultivation.

Poa pratensis L. A grass (No. 360 Shear) referred to this species was found abundant in an irrigated natural meadow at Melrose, Mont. It was one of the finest meadow grasses we saw, producing a large quantity of most excellent hay. It seemed superior to any cultivated form of the plant.

Poa sp. near *P. buckleyana* Nash. At Red Rock, Mont., we saw a meadow almost entirely occupied by this grass. It produced a fair quantity of good hay, though apparently not growing under the most favorable circumstances of soil and moisture.

Poa flava L. This species was frequently met with in meadows and as is well known is an excellent grass (*Poa serotina* Ehrh.).

Poa subaristata Vasey. A large part of the forage in some of the higher foothills, especially at Lima, Mont., is made up of this grass. It is evidently a valuable forage plant.

Poa buckleyana Nash. This, with the last-named species, which is less common, forms a large portion of the pasturage on the bench lands and in the foothills, and is an excellent species for both summer and winter grazing. It is one of the most valuable "Bunch-grasses" of the region.

MISCELLANEOUS PLANTS.

In addition to the above grasses we noticed a few other forage plants which gave indication of possible value for cultivation. Two native clovers—*Trifolium beckwithii* Brewer, and *T. longipes* Nutt.—were quite abundant in some wet meadows and added considerably to the bulk of hay. There were several other leguminous plants of possible value, such as *Astragalus adsurgens* Pall., *A. mortoni* Nutt., and *Thermopsis montana* Nutt. (fig. 13), which is said to be eaten by stock when not allowed to get too old before cutting.

In the above list we have not attempted to mention all the grasses of the region that have agricultural value, but only those that appeared to us to be most likely to repay careful investigation and trial under various conditions of climate and cultivation.

FIG. 13.—Montana Bush-pea (*Thermopsis montana*).

HAY-PRODUCING GRASSES.

Phalaris arundinacea L. Reed Canary-grass. Fair.

Stipa comata Trin. & Rupr. Needle and Thread. Sometimes cut for hay when young.

Stipa viridula Trin. Feather Bunch-grass. Fair hay when cut early.

Alopecurus occidentalis Scribn. Mountain Foxtail. Valuable in wet mountain meadows.

Agrostis alba L. Red-top. Introduced.

Agrostis asperifolia Trin. Rough-leafed Bent. Valuable.

Calamagrostis canadensis Beauv. Blue-joint. One of the best species.

Calamagrostis canadensis acuminata Vasey. Appears to be an excellent hay grass.

Calamagrostis macouniana Vasey. Small-flowered Blue-joint. Valuable.

Calamagrostis americana Scribn. American Blue-joint. Valuable.

Deschampsia cæspitosa Beauv. Tufted Hair-grass. A valuable species.

Spartina cynosuroides Willd. Fresh-water Cord-grass. Good when cut young.

Spartina gracilis Trin. Slender Cord-grass. Said to be good if cut when young.

Boutelona oligostachya Torr. Blue Grama. In wet meadows it sometimes becomes 2 to 3 feet high, and then makes excellent hay.

Beckmannia erucæformis Host. Slough-grass. Of some value in wet meadows.
Eatonia obtusata A. Gray. Eaton's grass. Fairly good.
Eatonia pennsylvanica A. Gray. Valuable.
Poa flava Linn. False Red-top. Excellent.
Poa lævigata Scribn. (*Poa lævis* Vasey.) Good.
Poa nevadensis Vasey. Nevada Blue-grass. One of the best species of the mountain meadows. Where abundant it makes good hay, and apparently deserves to be given a trial in cultivation.
Poa pratensis L. Kentucky Blue-grass. Excellent.
Panicularia aquatica (J. E. Smith) Kuntze. Reed Meadow-grass. Fair.
Festuca rubra L. Red Fescue. Valuable.
Festuca scabrella Torr. (fig. 14). Great Bunch-grass. A valuable species.
Bromus inermis Leyss. Awnless Brome-grass. Withstands long droughts. Introduced.
Elymus canadensis L. Canada Lyme-grass or Wild-rye. Hay of good quality, but coarse. The heads are often affected with ergot, and when so diseased are dangerous when fed to stock.
Agropyron spicatum Scribn. & Smith. Blue Stem. One of the best grasses in wet meadows (Nebraska and Montana).

FIG. 14.—Buffalo Bunch-grass (*Festuca scabrella*).

PASTURE GRASSES.

Stipa comata Trin. & Rupr.
Muhlenbergia gracilis Trin.
Bouteloua oligostachya Torr. Blue Grama. An exceedingly valuable species.
Bulbilis dactyloides Rafin. Buffalo-grass. Excellent, but its value has probably been overestimated.
Koeleria cristata Pers. Prairie June-grass. Excellent for early pasture (Nebraska).
Poa arida Vasey. Mountain Blue-grass. One of the best species for early pasturage.
Poa buckleyana Nash. In Idaho furnishes a large per cent of the pasturage. One of the best "Bunch-grasses."
Poa compressa L. Canadian Blue-grass. Excellent.
Poa lucida Vasey. Good.
Poa wheeleri Vasey. Valuable, and in good soil an excellent hay grass.
Festuca ovina L. Sheep's Fescue. An excellent species. Furnishes a large amount of spring and winter forage.

FORAGE PLANTS OTHER THAN THE GRASSES.

LEGUMINOSÆ.

Astragalus adsurgens Pall. Buffalo-pea. Of some value on the ranges.
Thermopsis montana Nutt. Montana Bush-pea. Eaten by stock, and where abundant makes good hay.
Trifolium longipes Nutt. Rocky Mountain Clover. "I consider this an excellent forage plant" (Shear).

APOCYNACEÆ.

Apocynum cannabinum L. Dog Bane. Said to be eaten by stock when cured with grass.

CHENOPODIACEÆ.

Eurotia lanata L. (fig. 15). Winter Fat. A very valuable winter forage, especially for sheep.

JUNCACEÆ.

Juncus balticus Willd. and *J. xiphioides montanus* Engelm. Rush. Constitutes a small part of the hay cut in wet places.

CYPERACEÆ.

Eleocharis palustris R. & S. Common Spike-rush. In many places constitutes the bulk of the hay.

FIG. 15.—Winter Fat or Sweet Sage (*Eurotia lanata*).

FIG. 16.—Salt-grass (*Sporobolus airoides*).

Carex festiva Dewey. Sedge. In Idaho this forms a considerable portion of the hay cut in wet meadows.

Carex marcida Boott. Sedge. Abundant in alkaline meadows, forming in some places the bulk of the hay.

Carex variabilis Bailey? Sedge. Constituting the bulk of the hay in places (Bozeman, Mont.).

EQUISETACEÆ.

Equisetum lævigatum A. Br. Mare's Tail. In many places regarded as a good hay plant, and is said to be especially liked by horses.

CHARACTERISTIC GRASSES OF DIFFERENT SOILS OR STATIONS.

In respect to location the principal grasses of the bottom and lower bench lands were *Agropyron spicatum, Elymus condensatus, Poa buckleyana, Koeleria cristata, Stipa viridula, Bouteloua oligostachya,* and *Calamagrostis inexpansa.*

Growing in sandy soil: *Eriocoma membranacea* and *Calamovilfa longifolia.*

Growing in alkaline soil: *Distichlis spicata, Puccinellia airoides, Sporobolus airoides* (fig. 16), and *Sporobolus asperifolius.*

Growing in low grounds and along creeks: *Beckmannia erucæformis, Catabrosa aquatica, Panicularia aquatica, Panicularia nervata, Poa flava,* and *Alopecurus geniculatus.*

Growing on the foothills and mountain slopes: *Festuca scabrella, Festuca ovina* and *Festuca rubra* in several forms, *Danthonia intermedia,* and several species of *Poa.*

AN ENUMERATION OF THE PLANTS COLLECTED, WITH ECONOMIC NOTES.

EQUISETACEÆ.

Equisetum lævigatum A. Br.

Montana: Melrose, common, forming a small portion of the hay in wet meadows; by many this is regarded as a good hay plant; said to be especially relished by horses; July 6 (341,[1] 2094).

GRAMINEÆ, Grasses.[2]

Andropogon nutans avenaceus Hack.

Colorado: La Salle, September 4 (2513).
Nebraska: North Platte, September 5 (2515).

Andropogon hallii grandiflorus var. nov.

Colorado: Mountains near Golden, August 30 (747), and in the foothills near Meadow Park, August 15 (605, 2366). A robust variety with the hairs of the rachis and pedicels yellow, spikelets 6 to 7 lines long, the second glume only being pilose on the keel near its apex. A subvariety of *A. hallii flaviolus* Hack.

Andropogon provincialis Lam.

Nebraska: Abundant in meadows along the North Platte River, September 6 (768).
Colorado: Hills near Golden, not common, August 30 (2499).

Andropogon scoparius Michx.

Nebraska: Common on the prairies and bluffs, September 5 (769, 2517).
Colorado: Meadow Park, frequent in rocky places in the foothills, August 15 (601); Golden, common in Clear Creek Canyon, August 30 (749, 750); Boulder, September 3, (762).

Panicum capillare L.

Nebraska: Central City, June 19 (264, 2011), abundant in sandy pastures along the Platte River, and affording a poor quality of forage when young.
Colorado: Golden, not common, August 29 (755, 2505).
Utah: Logan, August 9.

Panicum capillare brevifolium Vasey in Herb.

Culms tufted, low, 6 inches or less, bearing two or three short and broad leaves; primary panicle-branches nearly horizontal, few-flowered; spikelets acute, 1½ lines long, the acute first glume about one-half the length of the subequal second and third.

Montana: Manhattan, on a shaded sand bar in the Gallatin River; rare; July 19, 436. Also represented in the National Herbarium by a specimen from Washington.

Panicum crus-galli muticum Vasey.

Colorado: Meadow Park, frequent in moist ground, August 15 (602); Golden, growing in water and cultivated fields, August 29 (753, 2502, 2503).

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[1]Numbers 251 to 772 were collected by Mr. C. L. Shear, and numbers 2001 to 2523 were collected by Mr. P. A. Rydberg.

[2]Determined by F. Lamson-Scribner.

Panicum virgatum Linn.

Nebraska: North Platte, abundant in meadows along the river, September 5 (767, 2516).

Colorado: Meadow Park, August 15 (606); Golden, common, August 29 (756, 2508); La Salle, common, September 3 (2512).

Chætochloa viridis (Linn.) Scribn. (*Setaria viridis* Beauv.).

Nebraska: Central City, a common weed along roadsides and borders of meadows, June 19 (262, 2009).

Chætochloa italica (L.) Scribn. (*Setaria italica* Kth.)

Colorado: Idaho Springs, scarce, August 29 (746).

Cenchrus tribuloides L.

A dark-green, lax, leafy form, with slender bristle-like spines.

Nebraska: Central City, common, and a great pest, June 19 (257, 2015).

Homalocenchrus oryzoides Mieg. (*Leersia oryzoides* Sw.).

Nebraska: North Platte, meadow near Fremonts Slough, September 7 (772, 2523).

Phalaris arundinacea Linn. (fig. 17).

Nebraska: Central City, not common, June 19 (261).

Montana: Dillon, rather common on the banks of streams, July 3 (339, 2089); Townsend, common in the meadows, a good hay grass, July 16 (2166); Manhattan, common in moist thickets and shady meadows, July 17 (425).

Phalaris canariensis Linn.

Nebraska: Near a refuse heap on the river bank, Kearney, June 20 (269).

Savastana odorata (Linn.) Scribn. (*Hierochloë borealis* R. & S.).

Montana: Manhattan, here and there in the woods and on sandy river banks, July 17 (437, 2184); Logan, rare, moist thickets, July 27 (2511).

Idaho: Beaver Canyon, scarce; moist shady meadows and along small streams, June 26, 27 (306, 2060).

FIG. 17.—Reed Canary-grass (*Phalaris arundinacea*.)

Aristida fasciculata Torr.

Nebraska: North Platte, common on the prairies near the bluffs, of no economic value, June 22 (279, 2025).

Stipa comata Trin. & Rupr. (fig. 18).

Nebraska: North Platte, the common bunch-grass on the bluffs along the Platte, June 22 (278, 2024).

Montana: Dillon, common in a dry meadow, July 3 (334, 2078); Manhattan, stony hillsides and cultivated fields, July 17 (350, 433, 2195).

Stipa richardsoni Link.

Montana: Silver Bow, wooded hillsides, not common, July 8 (357, 2109); Garrison, occasional along the river, and among bushes near the railroad, July 10 (371, 2125).

Stipa scribneri Vasey.

Colorado: Georgetown, occasional on mountains, August 1 (641); Golden, here and there in Clear Creek Canyon, August 29 (2507).

Stipa spartea Trin.

Colorado: Georgetown, frequent on mountain sides, August 19 (636).

Stipa viridula Trin.

Montana: Dillon, on the prairies, but rather local, may be a good hay grass when cut early, July 3 (2087); Gallatin, meadows, where common it makes fair hay, July 16–29 (528, 2180, 2285); Manhattan, frequent in moist, shady places, July 17 (413).

Stipa lettermani Vasey.

Montana: Lima, canyon and mountain sides, August 5 (595, 2302).

Idaho: Beaver Canyon, not common in the meadows, August 7 (2343).

Stipa robusta (Vasey) Scribn. (*S. viridula robusta* Vasey).

Colorado: Idaho Springs, common, August 27, 28 (725, 2493, 2489), a lax-paniced form; Georgetown, mountain sides, frequent, August 1 (639).

Idaho: Beaver Canyon, frequent, dry mountain sides, June 27 (301) and August 7 (2345).

Eriocoma cuspidata Nutt.

Wyoming: Wamsutter, frequent along the railroads, June 24 (281½); Green River, only a few specimens in the valley, June 25 (2035).

Colorado: Georgetown, frequent on mountain sides, August 19 (644).

Montana: Melrose, stony hillsides, affording some pasturage, July 6 (349); Manhattan, abundant in neglected cultivated fields, July 17 (432, 2194). It is said by some to make good hay, but it is apparently a great pest, as it has taken possession of nearly a section of neglected irrigated bench land, and in one or two oat fields this species has taken more than half the ground.

FIG. 18.—Needle and Thread (*Stipa comata*.)

Oryzopsis micrantha Thurb.

Colorado: Meadow Park, scarce, in the foothills on rocks, August 15, 29 (599, 744).

Muhlenbergia racemosa (Mx.) B. S. P. (*M. glomerata* Trin.).

Nebraska: Central City, scarce along the river bank, June 29 (527).

Colorado: Meadow Park, frequent in rocky places in the foothills, August 15 (600); Golden, in Clear Creek Canyon, August 29, 30 (754, 2506); Boulder, September 3 (761).

Montana: Gallatin, along the railroad, July 29 (527, 2286).

Muhlenbergia gracilis (HBK.) Trin.

Colorado: Meadow Park, common in dry places in the foothills, perhaps a valuable pasture grass, August 15 (598, 2361); Idaho Springs, hillsides, a large form with comparatively broad leaves and many-flowered, rather dense panicles, August 29 (2494); Boulder, foothills, September 3 (759, 2510); Georgetown, common, August 19 (632, 643, 2399, 2403); Georgetown, frequent in a meadow, August 19 (632).

Lycurus phleoides HBK.

Colorado: Meadow Park, a bunch-grass, rather common on the foothills, August 15 (604, 2363).

Alopecurus geniculatus fulvus (J. E. Smith) Scribn.

Colorado: Georgetown, margins of streams, common, a large leafy form with spikes 3 inches long, August 17 (616, 2389).

Wyoming: Green River, common near the river, affording a little pasturage, June 25 (285, 2029).

Montana: Bozeman, in wet gravelly soil, Bozeman Canyon, July 22 (498, 2222); Dillon, July 3 (337); Red Rock, along streams, July 2 (328); Logan, July 27 (508).

Idaho: Beaver Canyon, June 26 (296).

Alopecurus occidentalis Scribn.

Montana: Deer Lodge, very rare, along the shady margins of a brook, July 10 (352, 2115).

Idaho: Beaver Canyon, common in wet meadows, a good hay grass adapted to such situations and probably worthy of cultivation, June 26 (291), and (2054) a form with rather small spikelets.

FIG. 19.—Fine-top Salt-grass (*Sporobolus asperifolius*).

Phleum alpinum L.

Colorado: Silver Plume, frequent along streams, altitude 13,000 feet, August 24 (678, 707, 2468); Georgetown, along the creek, very local, August 17 (2383).

Montana: Lima, along the margins of a mountain stream, August 6 (555, 2311); Bozeman, shady banks of Mystic Lake, July 25 (494, 2249).

Phleum pratense L.

Nebraska: Central City, June 17 (258, 2005).

Montana: Deer Lodge, July 9 (2132); Manhattan, July 17 (414); Townsend, scarce in meadows and along roadsides, a form with short spikes and longer awned empty glumes approaching *P. alpinum*, the whole plant somewhat glaucous, culms about 1 foot high, July 16 (434); Helena, in woods near the Warm Springs, July 13 (2140), spikes like those of No. 434, but the plant laxer and greener, "seems to be intermediate between *P. alpinum* and *P. pratense*" (Rydberg.)

Sporobolus airoides Torr.

Nebraska: North Platte, very common in meadows, forming large patches, too tough and wiry to be of value for pasturage, June 21 (273, 2020).

Montana: Dillon, July 3 (2077); Melrose, scarce in dry meadows and pastures, July 6 (346); Townsend, abundant in drier meadows, in some places constituting half the grass, July 15 (396, 2155).

Sporobolus asperifolius (Nees & Meyn.) Thurb. (fig. 19).

Nebraska: Kearney, common in wet meadows near the river, June 20 (268, 2016).

Colorado: Golden, rare, August 29 (2504).

Montana: Townsend, frequent in moist meadows, but too small to be of much value, nearly every specimen infested with smut (405, 2170); Logan, in sandy meadows, July 28, (526); Gallatin, frequent in dry meadows, July 29 (531); Melrose, occasional, in moist sandy soil, August 1 (534).

Sporobolus confusus (Fourn.) Vasey.

Montana: Logan, dry prairies and sandy brooksides, July 27 (501, 2264); Melrose, in an old road, August 1 (2291).

Sporobolus cryptandrus (Torr.) A. Gray.

Nebraska: Valley, common in sandy soil, of doubtful value, except perhaps for pasturage when young, June 18 (253, 2004).

Montana: Melrose, a small form, scarce in moist sandy soil near the river, August 1 (536).

Colorado: Meadow Park, a robust form, rather local, on the hills, August 17 (2367); Georgetown, mountain sides, August 19 (640, 2402); Golden, abundant, August 30 (751).

Sporobolus brevifolius (Nutt.) Scribn. (*Agrostis brevifolia* Nutt.; *Vilfa cuspidata* Torr.).

Nebraska: North Platte, prairies, September 7 (771, 2519).

Sporobolus depauperatus (Torr.) Scribn. (*Vilfa depauperata* Torr.).

Colorado: Georgetown, meadows, August 19 (627).

Idaho: Beaver Canyon, August 7 (2323).

Montana: Manhattan, in meadows, a tall and slender form agreeing in characters with *Vilfa richardsoni* Trin., July 17, (410, 2117); Dillon, in meadows, July 3 (333, 2081); Melrose, in meadows, July 6, (342, 2095); Madison River, in meadows, July 28 (524, 2276); Logan, dry bench lands, July 28 (516), a form which nearly corresponds to the type as figured in Hook. Flor. Bor. Amer.; Butte, July 31 (2297).

Sporobolus gracillimus (Thurb.) Vasey (*Vilfa gracillima* Thurb.).

Colorado: Georgetown, wet sandy places, August 19 (661, 2411).

Cinna latifolia (Trev.) Griseb. (*C. pendula* Trin.).

Montana: Helena, among bushes near the Warm Springs, July 13 (2139).

Colorado: Idaho Springs, moist shady banks of canyon and along streams, August 27 (713, 2473), and a lax, small-paniced form, August 28 (724, 2474).

Agrostis alba L.

Nebraska: Valley, June 18 (251, 2001).

Colorado: Idaho Springs, common, August 27 (735); Golden, common, near Clear Creek, August 29 (748, 2501).

Utah: Logan, in woods, Logan Canyon, August 9 (2349); Echo, a small form with dark-colored panicles, common on the sand bars in the river, August 13 (2359).

Montana: Helena, an excellent hay grass for irrigated land, more leafy and yields more heavily than the eastern *A. alba*, July 12 (384, 2137, 2138); Manhattan, sandy river banks, scarce, July 18 (435); Logan, common, woods and meadows, July 27 (504, 2269, 2349); Melrose, abundant in irrigated meadows, August 1 (543, 2294); Madison River, July 28 (2281, 2282).

Agrostis alba L. var.

A stoloniferous form with short, rather dense panicles, and short leaves.

Colorado: Georgetown, growing on tussocks in a marsh, August 19 (653, 2409).

Agrostis asperifolia Trin.

Montana: Helena, frequent in wet places, an excellent grass, July 13 (385); Bozeman (2220), robust form, along irrigation ditch; (2261) rare in canyon below Mystic Lake; (456) narrow-leafed with contracted dense panicle, frequent in wet meadows, a good hay grass; (2257) a small short-leafed form, culms naked below, and a short narrow dense panicle tinged with red, in the canyon below Mystic Lake; and 500, like 445, July 25; Manhattan, scarce in meadows along

the river, July 18, small form, 445, and 2209, like 456; Logan, near Gallatin River, scarce, a slender, rather lax, bright-green form, July 27 (2263); Lima, a form much like 2263.

Idaho: Beaver Canyon, August 9, 593, a slender, narrow-leafed form with open panicle, 2334, 584, like 445, on the margin of a mountain brook; 576½, scarce, in mountain woods, like 2257, but more leafy.

Agrostis humilis Vasey.

Colorado: Silver Plume, mountain side, August 24 (2456).

Agrostis rubra Linn.?

Colorado: Silver Plume, rare on the sides of the gulch, August 21 (2425).

Agrostis scabra Willd.

Colorado: Georgetown, frequent in the mountains, August 17 (613, 2392).

Montana: Gallatin, very common in wet meadows near the river, July 29 (2288); Manhattan, common in low meadows, in some places constitutes quite a large portion of the hay, July 17 (407, 423, 2173); Helena, railway embankments near the Warm Springs, July 13 (2142).

Idaho: Beaver Canyon, near small stream in the canyon, August 7 (2337).

Agrostis scabra Willd.?

Resembling a large form of *A. scabra*, tall, leafy, with wider leaf blades and larger panicles, the spikelets like *A. scabra*, but the flowering glume awned.

Colorado: Idaho Springs, common in the canyon, August 27 (737, 2485, 2487).

Montana: Bozeman, common in meadows, an excellent hay grass, July 22 (457, 2218, 2221); Townsend, banks of the Missouri River, July 15 (2151); Logan, common, shady river banks, July 29 (510).

Calamagrostis canadensis (Michx.) Beauv.

Colorado: Georgetown, margin of Clear Lake, August 17 (611, 2375); Idaho Springs, shady bank of mountain stream, August 27 (721).

Montana: Helena, among bushes, July 12 (2139½); Manhattan, frequent in moist thickets, an excellent hay grass, July 17 (417), with ligule much elongated; Logan, common along the Madison River, July 28 (579, 2278).

Calamagrostis canadensis acuminata Vasey.

Spikelets 1⅞ to 2 lines long; empty glumes, sharply acuminate. Approaches *C. langsdorffii*.

Colorado: Georgetown, common, in wet places, August 17 (615).

Montana: Manhattan, common on the river bank, a good hay grass, July 17 (419, 424, 2189).

Idaho: Beaver Canyon, common, August 7 (2328).

Calamagrostis scribneri Beal, Grass. N. Am. **2**: 343 (*C. dubia* Scribn., not Bunge).

Colorado: Idaho Springs, frequent along shady brooks, August 27 (728).

Calamagrostis inexpansa A. Gray.

Differs from *C. americana* Scribn. chiefly in its flat or less strongly involute and less rigid leaves, and its less rigid culms.

Nebraska: Central City, banks of Platte, not abundant, June 19 (266, 2008); North Platte, frequent, blades more involute, June 21 (275).

Colorado: Georgetown, frequent along the edge of Clear Creek, August 19 (646).

Calamagrostis macouniana Vasey.

Montana: Manhattan, in thickets near the river, a good hay grass, July 17 (422, 2191½), panicle larger and awns shorter than in the type.

Calamagrostis neglecta Gærtn.

Colorado: Georgetown, frequent along Clear Creek, August 17 (618).

Calamagrostis americana (Vasey); (*Deyeuxia neglecta americana* Vasey, Macoun Cat. Can. Pl., 4: 206 (1888); *Calamagrostis stricta robusta* Vasey, Wheeler's Rep. 6: 285 (1878); *Calamagrostis robusta* Vasey, Contr. U. S. Nat. Herb., 3: No. 1, 82 (1892); not *C. robusta* Franch. & Sav., nor *Deyeuxia robusta* Phil.).

Montana: Townsend, common in low meadows, July 15 (393, 398, 406, 2154); Lima, the principal grass in an alkaline meadow, August 5 (2318, 2319); Manhattan, moist thickets and shady meadows, July 17 (421, 2191); Logan, common, shady river banks, July 27 (503); Madison River, common in wet meadows, a good hay grass, July 28 (522). Confused with *C. neglecta* but distinguished by its rigid, marcid basal sheaths, more rigid culms and leaves, dense panicle and thicker and rougher empty glumes.

Calamagrostis purpurascens R. Br. (*C. sylvatica* Am. auct., not DC.).

Montana: Bozeman, woods on Baldy Peak, July 23 (2224); summit of Mount Bridger (468).

Colorado: Silver Plume, occasional, on the summit of the mountains, altitude 13,000 feet, August 24 (691, 696, 2470); Georgetown, on the mountains, a taller form (about 2 feet), panicle larger, more open, pale green, August 17 (614, 2380).

Calamagrostis suksdorfii Scribn., in Hack., True Grasses.

Montana: Bozeman, in the canyon, very rare, July 23 (2230).

Idaho: Beaver Canyon, one of the most common grasses in the meadows, especially in wet places, August 7 (575, 578, 2325, 2332).

Calamovilfa longifolia (Hook.) Scribn.

Nebraska: North Platte, common along the Platte River, September 7 (770, 2518).

Colorado: La Salle, along irrigation ditches, September 4 (765).

Montana: Townsend, frequent in moist meadows, July 15 (394).

Deschampsia cæspitosa (Linn.) Beauv.

Colorado: Silver Plume, frequent along the mountain brooks about timber line, altitude 11,000 to 13,000 feet, August 22, 24 (675, 683, 703, 709, 714, 2427, 2434, 2457, 2469½); Georgetown, in wet places along streams, August 19 (645).

Idaho: Beaver Canyon, common on the mountain sides, June 27 (300).

Montana: Lima, moist shady places, June, August (317, 319, 358, 554½, 567, 2067, 2306); Silver Bow, a valuable grass, common in the meadows, July 8 (2113); Manhattan, a valuable hay grass, but not so common here as at other places in the Gallatin Valley, in meadows along the river, July 18 (430, 443, 2202, 2203, 2193); Bozeman, July 22 (2219); Melrose, August 1 (537). Several varieties are included here.

Deschampsia elongata (Hook.) Munro.

Montana; Bozeman, gravelly margin of the creek in the canyon, below Baldy Peak, July 23 (473, 482, 2226).

Avena fatua Linn.

Utah: Cache Junction, common in cultivated fields, in many places quite a pest, August 9 (594); Logan, August 8 (2350).

Avena mortoniana Scribn. (Bot. Gazette, **21**: 133, Plate XI).

Colorado: Summit of Grays Peak, August 23 (697, 2439); Robinson, Summit County, altitude 13,800 feet, August, 1896 (1057 Shear).

Trisetum montanum Vasey.

Colorado: Georgetown, hillsides, fairly common, August 17 (622, 2394½); Idaho Springs, common, August 28 (718, 720, 2479, 2481, 2484, 2491).

Tristeum subspicatum (Linn.) Beauv.

Colorado: Georgetown, mountain sides, August 17 (624, 656, 2394); Silver Plume, altitude 11,000 to 13,000 feet, frequent in moist places, August 22 (668, 684, 681, 2422); Grays Peak, August 23 (2433, 2435).

Utah: Logan, common on the hillsides, August 6–9 (588, 589, 592, 2348).
Montana: Bozeman, scarce, moist woods near Mystic Lake, July 25 (483, 495, 2243, 2258).

Graphephorum wolfii Vasey.

Montana: Bozeman, near Mystic Lake, rare, July 25 (493, 2253); Lima, common in a moist canyon, August 5 (560).

Danthonia californica Boland.

Montana: Bozeman, moist places in the foothills, July 23 (477, 487).

Danthonia intermedia Vasey (fig. 20).

Montana: Mystic Lake, July 25 (2244).
Idaho: Beaver Canyon, meadows and mountain sides, June–August (302, 586, 2057, 2338).

FIG. 20.—Oat-grass (*Danthonia intermedia*).

FIG. 21.—Cord-grass (*Spartina cynosuroides*).

Danthonia parryi Scribn. (Bot. Gazette, **21**: 133).

Colorado: Georgetown, August 19 (638, 2397).

Spartina cynosuroides (Linn.) Willd. (fig. 21).

Nebraska: North Platte, common in the meadow near the river, September 5 (2514).
Colorado: La Salle, along irrigation ditches and South Platte River, September 4, (764).
Montana: Logan, rather common; makes fair hay when cut before the stems become tough, said to be spreading rapidly and to be becoming more abundant each year, July 28 (523, 2283).

Spartina gracilis Trin.

Montana: Manhattan, common in wet meadows, July 18 (446, 2204); Townsend, low meadows near the river, good for hay if cut young, July 15 (392, 2152); Dillon, July 3 (335, 2080).

Bouteloua curtipendula (Michx.) Torr.

Nebraska: North Platte, common on the hills, September 7 (2521).
Colorado: Meadow Park, common, August 15 (603, 2364).

Bouteloua hirsuta Lag.

Colorado: Meadow Park, here and there on the hillsides, but not common, August 15 (2360).

Bouteloua oligostachya (Nutt.) Torr.

Nebraska: Central City. the most valuable grass of the high plains; is the best pasture grass even in winter, and is always preferred by cattle and horses to all other grasses; in wet meadows it sometimes becomes 2 or 3 feet high, and then makes excellent hay; June 19 (2012).
Colorado: Georgetown, common on the mountain slopes, August 19 (642).
Montana: Melrose, rare in this region, growing in patches 1 to 10 yards in diameter at intervals over the dry upland praries, locally known as "buffalo grass," July (351, 2104, 2290); Manhattan, a very valuable species, but each year becoming scarcer, owing to overstocking of the ranges, July (409, 2179).

Beckmannia erucæformis (Linn.) Host.

Colorado: Georgetown, common in wet places, August 19 (659, 2412).
Montana: Madison River, July 28; Townsend, common in wet sandy soil along streams, of considerable value for hay, July 16 (389, 2169); Red Rock, common along streams, July 2 (327); Deer Lodge, common along water courses, July 9 (2134).

Schedonnardus paniculatus (Nutt.) Trelease (*S. texanus* Steud.).

Nebraska: Central City, abundant in the sandy pastures near the Platte River; of no value as a forage plant, June 19 (260, 2006).
Colorado: Idaho Springs, rare, on the mountain sides, August 29 (740).

Bulbilis dactyloides (Nutt.) Raf. (*Buchloë dactyloides* Engelm.).

Nebraska: Central City, covering more or less extensive patches in the meadows and pastures along the Platte River, an excellent pasture grass, often confused with grama (*Bouteloua oligostachya*); its value as forage seems to have been exaggerated; June 19 (267, 2014).

Munroa squarrosa (Nutt.) Torr.

Nebraska: North Platte, on an old prairie-dog town, without economic value, June 21 (277, 2023).
Colorado: Golden, common in waste grounds along the railroad, August 30 (758, 2500); Idaho Springs, rare, in sandy places, August 28 (745).
Montana: Logan, scarce, only found on the railroad track, July 27 (515, 2265).

Phragmites vulgaris Lam.

Nebraska: North Platte, abundant in meadows along the river, September (766).
Colorado: La Salle, along an irrigation ditch, but not common, September 3 (2511).
Montana: Logan, abundant on sand bars along the Madison River, July 28 (525).

Koeleria cristata (Linn.) Pers.

Nebraska: Valley, one of the most valuable grasses for early pasturage, June 18 (2003); Central City, June 19 (255).
Colorado: Georgetown, in a meadow, August 20 (635, 637, 2414½); Idaho Springs, along streams, and on the mountain sides, August (637, 726, 738, 741, 2476, 2482, 2492).
Montana: Lima, one of the most common grasses of the dry prairies (this, a form of *Poa buckleyana*, *Carex filifolia*, and *Agropyron* species, coustitute the principal pasturage of this region) July (318, 2069); Manhattan, common in moist meadows, July 17 (412); Deer Lodge, common in river meadows, July 9 (373); Silver Bow, July 8 (2111).
Idaho: Beaver Canyon, rare, moist mountain sides, August 7 (585).

Eatonia obtusata (Michx.) A. Gray.

Nebraska: Valley, a form with purplish panicles (var. *purpurascens* Vasey in U. S. Natl. Herb.), common on low ground, June 18 (252, 252½, 2002); Kearney, in low land, probably of some value as pasturage, June 20 (271).

Montana: Townsend, common in wet meadows, a fair hay grass, July 15 (390, 2150) a large form (var. *robusta* Vasey); Melrose, common in moist sandy soil, August 1 (540); Manhattan, rare, on the shady river banks, July 9 (439).

Eatonia pennsylvanica (D. C.) A. Gray.

Montana: Manhattan, in moist thickets and wet meadows, but not common, July 17 (428, 442, 2174); Logan, a good hay grass, in meadows near the river, July 27 (517, 2268).

Eatonia pennsylvanica major Torr.

Colorado: Idaho Springs, scarce, on the moist mountain slopes, August 29 (742).

Montana: Townsend, sand bars in the Missouri River, July 15 (2160); Bozeman, scarce, in wet meadows, a good hay grass, July 22 (458); Melrose, rare, August 1 (538).

FIG. 22.—Thick-rooted Bunchgrass (*Melica bulbosa*).

Eragrostis major Host.

Nebraska: Central City, common along roadsides, June 19 (265); North Platte, prairies, September (2520).

Colorado: Golden, common in waste ground, August 30 (757).

Eragrostis pectinacea (Michx.) Steud.

Colorado: Meadow Park, only a few plants seen along an old road, August 15 (2365).

Catabrosa aquatica (Linn.) Beauv.

Montana: Bozeman, common in ditches, July 22 (462); Townsend, rather scarce, in shady meadows, July 16 (401).

Idaho: Beaver Canyon, common in wet places, perhaps of some economic value, June 27 (295, 2052).

Melica aristata Bolander.

Montana: Bozeman, on moist mountain sides about Mystic Lake, July 25 (491, 2246, 2250); in the canyon below Baldy Peak, July 23 (2232).

Melica bulbosa Geyer. (fig. 22).

A reduced few-flowered form = 304 S. Watson from Nevada.

Montana: Bozeman, frequent in the mountains, July 23 (470); Lima, moist shady mountain sides, August 6 (557).

Melica parviflora (Porter) Scribn. (*M. porteri* Scribn.).

Colorado: Idaho Springs, in shady situations, not common, August 28 (732, 2486).

Melica spectabilis Scribn.

Idaho: Beaver Canyon, shady mountain sides, rare, June 27 (307).

Montana: Bozeman, common on the hillsides around Mystic Lake, July 25 (496, 2248).

Distichlis spicata stricta (Thurb.) Scribn. (*Brizopyrum maritimum strictum* Thurb.).

Nebraska: North Platte, abundant in alkaline soil and salt meadows, June 21 (276, 2019). Cattle seem to avoid this grass as long as it is possible to obtain anything else.

Montana: Melrose, common in alkaline soil, July 6 (344).

Dactylis glomerata Linn.

Colorado: Georgetown, August 17 (625).

Poa alpina Linn.

Colorado: Georgetown, in wet sandy soil, scarce, August 20 (662, 2386); Silver Plume, along the margins of a brook at the foot of Grays Peak, August 23 (687, 2445).

Montana: Lima, in moist thickets along a mountain brook, August 6 (563, 2305); Bozeman, in the canyon below Mystic Lake, scarce, July 25 (2234), and with this a few specimens (2236) was found a form with elongated leaves and larger panicle and spikelets.

Poa annua Linn.

Colorado: Georgetown, in moist places, common, August 18 (652, 2385).

Utah: Echo, common along a small stream, August 13 (2357).

Poa arctica R. Br.

Colorado: Silver Plume, frequent along the margins of a stream near timber line, altitude about 10,000 feet, August 24 (676, 699); Grays Peak, in moist places near Stephen's mine, altitude 11,000 to 12,000 feet, August 23 (682, 2443).

Poa arida Vasey. (*P. andina* Nutt.).

Nebraska: Kearney, abundant in the drier meadows along the Platte River, constituting about half the grass; it makes a turf inferior to that of *Poa pratensis*, but grows in much poorer and harder soil, where it might be substituted for that species; it does not grow in the driest places and is hardly to be recommended for the arid regions unless it can receive a comparatively good supply of water. Sometimes cut for hay, but better suited for pasture; June 20 (270, 2017).

Wyoming: Green River, frequent in meadows, June 25 (287).

Poa cæsia J. E. Smith.

Colorado: Silver Plume, growing in a gulch, occasional, altitude about 11,000 feet, August 27 (667).

Poa compressa Linn.

Colorado: Georgetown, meadows, August 19 (650, 2406).

Montana: Deer Lodge, July 9 (2132½); Helena, along streams and irrigating ditches, July 13 (382, 399, 2143).

Poa cusickii Vasey.

Idaho: Beaver Canyon, on the foothills and mountains, in woods, June 27 (309, 2055).

Poa epilis Scribn. (*P. cuspidata* Vasey, in part).

Colorado: Silver Plume, along streams upon the mountain sides, common, altitude, 12,000 to 13,000 feet, August 24 (702, 712, 2471). This grass has been confused with *P. cuspidata* Vasey, which, according to type specimens, is *P. wheeleri*.

Poa fendleriana spicata. (Vasey) Scribn. (*P. arida spicata* Vasey).

Colorado: Silver Plume, along mountain streams, altitude 11,000 feet, August 21 (666, 672, 2418); Grays Peak, in woods at the foot of Grays Peak, scarce, August 23 (685, 2444).

Montana: Townsend, on sand bars in the Missouri River, rare, July 15 (2158); Silver Bow, a bunch grass growing very sparingly on the hillsides, July 8 (2112); Manhattan, in a meadow, not common, July 17 (2178). This differs from the species in its taller habit, longer, narrower, and interrupted greenish panicle.

Poa lævigata Scribn. (*P. læris* Vasey, not Borb).

Plant somewhat glaucous; culms cæspitose; the dry, persistent basal sheaths rather rigid; blades rather short, narrow, strongly involute, rigid; panicle narrow; spikelets much as in *Poa buckleyana*.

Wyoming: Green River, on very dry hills, but only in scattered bunches, June 25 (2039). A low, short-leafed form.

Montana: Red Rock, common in meadows, an excellent grass, worthy of cultivation, July 2 (325); Melrose, common in wet meadows, a fair hay grass, July 6 (343, 348, 2096, 2097) (the last two like No. 2039, but less rigid); in dry soil in a meadow August 1 (2296); Deer Lodge, common in meadows along the river, July 9 (363, 374, 2129) (the last two representing a reduced form with culms 9 inches or less high, and few and small leaves; of more value for pasturage than for hay); Lima, forms a very good meadow, August 5 (2320).

FIG. 23.—Mountain Blue-grass (*Poa nevadensis*).

Poa laxa occidentalis Vasey.

Colorado: Grays Peak, altitude 13,000 to 14,000 feet, August 23 (690, 2440).

Poa lettermani Vasey (*P. brandegei* Beal, Grasses N. Am., **2**: 544).

Colorado: Grays Peak, altitude 14,000 feet, scarce near the summit, August 23 (689, 2441, 2448).

Poa lucida Vasey. (This species is closely allied to *P. buckleyana*.)

Colorado: Georgetown, hillsides near Clear Lake, August 17 (2376); Silver Plume, August 24 (2465½).

Wyoming: Green River, in meadows, apparently an excellent grass, June 25 (288).

Montana: Lima, along the margin of a mountain brook, not common, August 6 (562, 2312).

Poa nemoralis Linn.

Colorado: Georgetown, frequent among rocks on mountain sides, altitude 10,000 feet, and in the canyon, August 17 (607, 619, 2388); Silver Plume, frequent on the mountain side and along the brook, August 21 (670), ligule longer and culms and sheaths more scabrous than in typical specimens (2420), like No. 670, but smoother; Idaho Springs, frequent on a gravelly hillside, August 27 (734).

Idaho: Beaver Canyon, frequent in mountain woods, August 7 (576).

Utah: Echo, common in the canyon, August 13 (2355).

Montana: Melrose, only a few specimens found among bushes in a canyon, July 6 (2100); Manhattan, rather scarce in woods and meadows along the Gallatin, July 17 (2175, 2192); Bozeman, common in the woods below Baldy Peak, July 23 (2229), in wet canyon (463), scarce, in stony places near the summit of the mountains (469); Lima, rather common in the canyon, August 6 (2309), frequent on dry hills (556), on the moist bank of a mountain stream (564) (a form approaching *P. flava*).

Poa nevadensis Vasey (fig. 23).

Idaho: Beaver Canyon, frequent in mountain woods, August 7 (580).

Montana: Red Rock, a "bunch-grass," very common in a meadow, without doubt an excellent grass for hay and worth cultivating, July 2 (2091); Bozeman, on hillsides east of Mystic Lake, July 25 (2259) (a form with dense panicle); Melrose, quite abundant in an irrigated meadow with *Agrostis alba* and *Poa pratensis*, August 1 (541, 2293); Lima, frequent in the foothills and on the banks of streams, August 5 (552, 567); with *Poa lucida*, August 6 (2313) (a form with dense panicle).

Poa pattersoni Vasey.

Colorado: Grays Peak, altitude 13,000 to 14,000 feet, frequent, August 23 (690).

Poa pratensis L. (Kentucky Blue-grass.)

Nebraska: Central City, a tall, broad-leafed form, apparently native in Nebraska, growing always near water on river banks, etc., found scantily near Platte River, June 19 (2007).

Colorado: Georgetown, along mountain streams, in meadows, and on moist mountain sides, in some places rare, in others common, in one place growing with *Danthonia parryi*, August 17–20 (617, 623, 626, 654, 2384, 2398, 2413); Idaho Springs, in some places frequent, in others scarce, in a moist, shady canyon and along brooks, August 27 (719, 722, 727); common in a canyon, August 28 (2480) (a stout form, with wide blades and large panicle).

Wyoming: Green River, escaped along the river, not common, June 25 (2031).

Idaho: Beaver Canyon, not common but apparently indigenous (2051), frequent in moist meadows, June 26 (294); growing luxuriantly in damp woods on a mountain side, June 28 (304, 2062); frequent on shady mountain sides, June 27 (298) (a slender form, with narrow blades and small panicles).

Montana: Red Rock, wet places along streams (as this variety is tall and leafy it would doubtless be valuable for hay), July 2 (329, 2092); Melrose, abundant in irrigated meadows, where it seems to be the principal grass, and is very valuable for hay, being known locally as "red-top," a name also applied to *Deschampsia caespitosa*, July 6 (2101), July 7 (360), July 6 (2102) (a taller form growing in wetter places, with less purple panicle); Deer Lodge, frequent in meadows along the river, a tall, very leafy form, doubtless excellent for hay, July 9 (376, 2133); Townsend, in woods near the river, scarce (2167), frequent in moist, shady meadows, a good hay grass, July 16 (400); Manhattan, in woods near Gallatin River, July 17 (2181); Bozeman, in a meadow near the experiment station, scarce, July 22 (2215, 2217), occasional along a stream in Bozeman Canyon (489), scarce, in woods near Mystic Lake, July 25 (484) (a stout form with wide blades and large panicle); Melrose, August 1 (2295); Lima, comparatively common in the canyon, August 6 (2310).

FIG. 24.—False Red-top (*Poa flava*).

Poa rupestris Vasey, not Bieb.

Colorado: Silver Plume, occasional on mountain summits, altitude 11,000 to 13,000 feet, August 24 (694, 2454). Apparently a reduced form of *P. nemoralis*.

Poa flava Linn. (*P. serotina*, Ehrh.) (fig. 24).

Colorado: Georgetown, scarce, along the margin of Clear Creek, August 16–18 (663, 2396); Idaho Springs, common along a shady brook, August 27–28 (716, 2478).

Montana: Helena, among bushes near the Warm Springs, July 13 (2144, 2145); Townsend, near the Missouri River, rare, July 15 (2162); Manhattan, rather common in wet woods near the river, July 17 (427½, 2190); Bozeman, occasional in

Bozeman Canyon, July 25 (499) (a form approaching *Poa nemoralis*); Logan, scarce, in a moist thicket near Gallatin River, apparently an excellent grass, July 27 (513, 2267); Gallatin, in a ditch near the river (2289), scarce, in a dried-up pond, July 29 (532).

Poa subaristata Scribn. (in Beal, Grasses N. Am., **2**: 533).

Idaho: Beaver Canyon, common on dry hills, where it is one of the most valuable pasture grasses, June 27 (2056).

Montana: Lima, common on hills and mountains, forming a considerable per centage of the grass and furnishing good pasturage, June 30–July 1 (311, 315, 321, 322, 323, 2075, typical). Nos. 311, 315, and 2056 are doubtfully referred here.

Poa suksdorfii Vasey.

Colorado: Silver Plume, very rare, on the summit of the mountains, altitude 13,000 feet, August 24.

Montana: Lima, occasional on hillsides and mountains, June 30 (312).

Poa buckleyana Nash (*P. tenuifolia* Buckl.) (fig. 25).

Colorado: Georgetown, only one small tuft found, leaves more or less glaucous, August 17 (2390); Silver Plume, a "bunch-grass" comparatively common in the gulch (2428), scarce along the margin of a mountain brook, August 21–24 (680, 2165½).

Wyoming: Dry prairies along the Union Pacific Railway, June 24 (280); Green River, in a meadow near the river, not frequent, June 25 (2034).

Idaho: Beaver Canyon, common on gravelly mountain sides and dry hills, constituting a considerable part of the pasturage, June 27 (299, 308, 2056½); in woods, June 28 (2063).

Montana: Bozeman, common on stony mountain sides, July 23 (467), only two specimens found in a canyon below Mystic Lake, July 25 (2260) (a lax form with slightly pubescent flowering glumes, probably growing in wet ground); Lima, in a meadow near a stream, August 5 (2321).

FIG. 25.—Bunch Redtop (*Poa buckleyana*).

Poa wheeleri Vasey.

Colorado: Silver Plume, common along the brook, August 21–24 (705, 2419, 2421, 2462, 2462½); occasional along a stream in a gulch, altitude abont 11,000 feet, August 21 (665, 674); along a brook near timber line, August 24 (698, 701, 710).

Idaho: Beaver Canyon, on wooded hillsides, a very common and luxuriant apparently valuable grass, June 27 (297, 2059).

Montana: Bozeman, very scarce on the gravelly bank of a brook in Bozeman Canyon, July 25 (478, 490).

Utah: Logan, in moist ground near the summit of a mountain, scarce, August 9 (590, 591).

Puccinellia airoides (Nutt.) Wats. & Coult. (*Poa airoides* Nutt.) (fig. 26).

Wyoming: Along Green River, June 25 (286, 2033).

Montana: Dillon, irrigated meadows, not common, July 3 (331), August 2 (2298); Manhattan, wet meadows, July 19 (2198); Helena, along irrigating ditches, July 12 (380, 2135); Silver Bow, in dry places by the roadside, July 8 (359); Melrose, in meadows, scarce, August 1 (545).

Panicularia aquatica (Linn.) Kuntze. (*Glyceria aquatica* J. E. Smith).

Utah: Echo, about a mill pond, August 13 (2354).

Montana: Garrison, frequent in wet, shady places along the river, July 10 (370, 2124); Townsend, common in wet thickets, July 16 (402); Bozeman, common in wet places, July 22 (454); Logan, common near water and said to make fair hay, July 27 (509, 2266).

Colorado: Georgetown, frequent in wet places, August 19 (657).

Panicularia nervata (Willd.) Kuntze (*Glyceria nervata* Trin.).

Colorado: Idaho Springs, frequent along streams, August 27 (731).

Montana: Lima, common in wet places, June 29 (316, 2068, 2307); Manhattan, frequent in wet, shady places, July 17 (418, 426, 2182, 2200).

Festuca elatior Linn.

Montana: Helena, occasional in wet places, July 13 (388, 2141).

Utah: Logan, at the experiment station, August 9 (2352).

FIG. 26.—Manna-grass (*Puccinellia airoides*).

FIG. 27.—Sheep Fescue (*Festuca ovina*).

Festuca jonesii Vasey.

Montana: Bozeman, rare in woods and thickets, with *Bromus ciliatus*, July 24 (465, 2228).

Festuca ovina Linn. (fig. 27).

Colorado: Georgetown, common on hills and mountain sides, August 17 (625½, 2379); Silver Plume, on moist mountain sides, altitude 11,000 feet, August 21–24 (671, 708, 2117, 2415); Idaho Springs, frequent in a moist canyon, August 27 (715, 2483).

Idaho: Beaver Canyon, common on the mountain sides and apparently a good pasture grass, especially for sheep, June 27 (305, 2061), August 7 (581, 2331).

Montana: Lima, abundant, especially on the foothills and mountain sides, in many places constituting half of all the grass and affording excellent winter grazing, June 30 (310, 314, 320, 370, 2070), August 6 (2316); Bozeman, frequent on the mountain sides, a good pasture grass, July 24 (475, 2231).

Festuca ovina brevifolia (R. Br.) S. Wats.

Colorado: Grays Peak, in moist places, frequent, altitude 14,000 feet, August 23 (688, 2449, 2450).

Festuca ovina arizonica (Vasey) Beal.

Colorado: Idaho Springs, a rare, glaucous bunch-grass, August 28 (2472).

Festuca kingii (S. Wats.) Scribn. (*Poa kingii* S. Wats.).

Montana: Lima, a tall, dioecious "bunch-grass," occasional or common in the foothills and canyons, June 30 (313, 2065), August 6 (561, 2303).

Festuca rubra Linn. (fig. 28).

Colorado: Idaho Springs, rare on the sides of a canyon, August 28 (2477).

Montana: Deer Lodge, abundant in meadows along the river, in some places the predominant species, and apparently valuable for hay, July 9 (377, 2123); Silver Bow, frequent in moist meadows, July 8 (353, 2108); Bozeman, common in meadows on the experiment station farm, and considered a good hay grass, July 22 (460, 492, 2223); common on the moist mountain sides about Mystic Lake, July 25 (464, 492, 2262); Butte, in a low meadow, scarce, July 31 (547).

FIG. 28.—Red Fescue (*Festuca rubra*).

Festuca scabrella Torr.

Montana: Silver Bow, a valuable bunch-grass, frequent on the hill and mountain sides, July 8 (356, 2106).

Festuca octoflora Walt. (*F. tenella* Willd.).

Colorado: Golden, in a canyon southeast of Idaho Springs, rare, August 30 (2498).

Bromus brizæformis Fisch. & Meyer.

Utah: Echo, a few specimens found near an old mill, August 13 (2353).

Bromus breviaristatus (Hook.) Buckl. (*B. aleutensis* Trin.).

Idaho: Beaver Canyon, frequent in meadows along a mountain stream, August 7 (573, 596, 2322, 2342).

Utah: Logan, common in woods, August 9 (2347).

Montana: Deer Lodge, common in a meadow, July 9 (378, 2119); Lima, frequent on moist mountain sides (560½, 569, 2314); Bozeman, in cultivated fields, frequent, July 22-25 (449, 476, 2213, 2233¾, 2247); Manhattan, frequent in moist shady places along the river, July 17 (415).

The specimens from Idaho and Utah and No. 560½ from Montana are glabrous, with the glumes scabrous, the outer ones acute. In all the other specimens the spikelets are pubescent, as are the lower sheaths and leaves.

Bromus ciliatus Linn.

Colorado: Silver Plume, frequent on mountain sides, August 21–24 (679, 711, 2466); Georgetown, above Colorado Central mine, a form with stout culms and large spikelets, August 17 (2381).

Idaho: Beaver Canyon, August (723, 2329).

Montana: Manhattan, frequent in moist meadows, July 17 (431); Bozeman, in woods, a form with a rather lax, slender, and few-flowered panicle, July 23 (2227); along the banks of the Madison River, not common, July 28 (2275).

Bromus porteri (Coulter) Scribn.

Colorado: Georgetown, common on mountain sides, August (610, 624½); Idaho Springs, on mountain sides and along the road, frequent, August (739, 2490, 2496).

Bromus inermis Leyss. (Smooth Brome-grass).

Montana: Bozeman, cultivated on the experiment station grounds, where it is said to withstand dry weather well, July 22 (447).

Bromus kalmii A. Gray.

Utah: Cache Junction, August 9 (597).
Idaho: Beaver Canyon, common in a meadow, August 7 (2344).
Montana: Bozeman, in woods in the canyon, rare, a taller weak-stemmed form, with more spreading and many-flowered panicle, resembling *B. ciliatus*, July 22 (2227½); Lima, frequent along the moist bank of a mountain brook, August 6 (566, 2315).

Bromus mollis Linn.

Montana: Garrison, only a few specimens found on a railway embankment, July 10 (2126).

Bromus pumpellianus tweedyi Scribn. var. nov.

Culms stout, about 2 feet high; leaves short; panicle dense, short; spikelets small; flowering glumes very villous.
Montana: Lima, frequent along a mountain brook, August 6 (568, 2304).

Bromus secalinus Linn.

Montana: Garrison, near the railway track, scarce, July 10 (368); Bozeman, in a moist meadow with *B. breviaristatus*, rare, July 22 (453, 2214).

Agropyron caninum R. & S.

Montana: Manhattan, in a moist meadow, July 17 (416, 2176); Bozeman, in a moist meadow, July 22 (452); Melrose, in moist sandy soil, August 1 (542).

Agropyron dasystachyum subvillosum Scribn. & Smith.

Colorado: Georgetown, low ground, August 19 (631).
Idaho: Beaver Canyon, August 7 (587, 2341).
Montana: Deer Lodge, on the river bank July 9 (2130); Red Rock, in a meadow, August 3 (549).

Agropyron divergens Nees.

Idaho: Beaver Canyon, on hillsides, June 28 (2064).
Montana: Lima, July 1–2, August 6 (326, 330, 559); Melrose, rocky hillsides, July 6 (2103); Silver Bow, hillsides, July 6 (2110); Bozeman, mountain sides, July 23 (472, 474).

Agropyron divergens tenuispicum Scribn. & Smith.

Montana: Lima, prairies, July 1 (2074); Melrose, rocky cliffs, July 6 (347); Helena, hillsides, July 12 (2147).

Agropyron gmelini Scribn. & Smith.

Idaho: Beaver Canyon, August 7 (2327).
Montana: Deer Lodge, in a meadow, July 9 (379); Bozeman, on Baldy Peak, July 23 (2233).

Agropyron pseudorepens Scribn. & Smith.

Nebraska: Kearney, in a meadow, June 20 (272, 2018).
Colorado: Georgetown, mountain side, August 17–19 (621, 649, 651); Idaho Springs, August 27–28 (733, 2488).
Montana: Dillon, on the bank of a brook, July 3 (340, 2088); Helena, along a ditch, July 12 (383); Manhattan, on a shady river bank (411), in sandy places, July 17–18 (440).

Agropyron pseudorepens magnum Scribn. & Smith.

Colorado: Enterprise, August 19 (2401). The type.

Agropyron riparium Scribn. & Smith.

Montana: Deer Lodge, July 9 (372); Garrison, on a river bank, July 10 (369, 2127).

Agropyron scribneri Vasey.

Colorado: Silver Plume, summit of mountain, August 24 (2453).

Agropyron spicatum (Pursh) Scribn. & Smith (*A. glaucum* Am. auct.).

Nebraska: Central City, June 19 (256).
Montana: Logan, moist thickets, July 27 (514, 2271).

Agropyron spicatum molle Scribn. & Smith.

Montana: Helena, July 13 (386); Gallatin, in meadows, scarce, July 29 (530); Lima, in a meadow, August 5 (2317).

Agropyron tenerum Vasey.

Colorado: Georgetown, in a meadow, August 17–19 (2391).
Idaho: Beaver Canyon, August 7 (2330).
Montana: Townsend, on a sand bar in the Missouri River, July 15–16 (2159), in a meadow (404); Manhattan, July 17 (2177); Butte, in a meadow, July 31 (546); Lima, August 6 (572).

Agropyron vaseyi Scribn. & Smith.

Utah: Echo, August 13 (2356).
Montana: Townsend, on a hillside, July 16 (2164); Dillon, prairies, August 2 (2299); Lima, August 5 (2301).

Agropyron violaceum andinum Scribn. & Smith.

Colorado: Silver Plume, summit of mountains, altitude 13,000 feet, August 24 (393, 682, 692).

Hordeum jubatum L.

Nebraska: Central City, abundant throughout the Platte Valley, and a great pest, in many places taking almost complete possession of the meadows, and of no value except when very young, June 19 (263, 2010).
Colorado: Georgetown, common in low ground, August 9 (664).
Montana: Deer Lodge, in meadows, in one meadow constituting nearly one-half of the grass, July 9 (375, 2117).

Hordeum nodosum L.

Colorado: Georgetown, a "bunch-grass," occasional along a brook, August 17 (620, 2387, 2395).
Wyoming: Green River, only a few specimens collected near the river, June 25 (2030).
Idaho: Beaver Canyon, frequent on rocky hills, June 27 (303).
Montana: Dillon, frequent in gravelly soil along the river, of no economic value, July 3 (336, 2082); Melrose, common on the river bank, July 6 (2099); Bozeman, frequent about Mystic Lake, July 25 (488); Lima, frequent along the bank of a mountain stream, August 6 (565).

Elymus canadensis L.

Colorado: Georgetown, common at the entrance of Clear Creek Canyon, August 30 (752).
Montana: Logan, two specimens found along the railway track (2270 frequent on shady river banks) July 27 (505); Gallatin, a few specimens found in a meadow and on the railway embankment, said to be a good hay grass, but often infected with ergot, July 29 (2284–2287).

Elymus robustus Scribn. & Smith.

Colorado: Idaho Springs, on the bank of a brook, local, August 28 (2495).

Elymus canadensis glaucifolius (Muhl.) Torr.

Montana: Townsend, culms rather low, stout and hard, whole plant glaucous, July 16 (2163).

Elymus condensatus Presl. (fig. 29).

Wyoming: Wamsutter, a tall "bunch-grass," 3 to 5 ft. high, growing along the railway, June 24 (2027); Green River, frequent in meadows, June 25 (289)

Montana: Helena, in a prairie, sometimes 5 to 6 feet high, growing in big clumps or bunches (2136), common in sandy and gravelly soil along streams, too rank and tough for hay, July 12 (381); Townsend, frequent in low ground near the Missouri, July 15 (391); Bozeman, frequent in moist, shady places, July 23 (471).

Elymus glaucus Buckl.

Utah: Logan, common in woods in the canyon, August 9 (2346).

Idaho: Beaver Canyon, comparatively rare in a wooded canyon (2324), common on the hillside west of the canyon, August 7 (574, 2326).

Montana: Bozeman, in a canyon below Baldy Peak, not common, July 23 (2225).

Elymus macounii Vasey.

Montana: Townsend, common in meadows along the river, perhaps a good hay grass, July 16 (403, 2168); Bozeman, frequent in a moist field, July 22 (450); frequent in the foothills, July 23 (466); Logan, in thickets and on a gravelly river bank, scarce, July 27 (506, 512); Red Rock, frequent in a meadow, August 3 (550).

Elymus triticoides (Nutt.) Buckl.

Colorado: Georgetown, frequent on hills above Clear Lake, August 17 (609, 2371, 2378), scarce in a valley, August 19 (633); Enterprise, very common in a valley, August 19 (2400); Silver Plume, frequent in the mountains, August 24 (706); Idaho Springs, frequent on moist mountain sides and on the sides of the canyon, August 27–28 (736, 2475).

FIG. 29.—Wild-rye (*Elymus condensatus*).

Wyoming: Green River, a common "bunch-grass" on the bluffs (282), a "bunch-grass" growing on the very driest and hardest hills ("bad lands"), June 25 (2041).

Montana: Dillon, a tall, coarse "bunch-grass," growing especially in moist places along railways, perhaps of some value for hay, but probably too coarse, July 3 (332, 2076), dry prairies, not common, August 2 (2300); Madison River, here and there in the meadows with *Agropyron spicatum* and another species of *Agropyron*, regarded as a good hay grass, July 28–29 (2274, 2279).

Elymus angustus Trin. (in Ledb. Fl. Alt.).

Wyoming: Green River, only a few specimens found at edge of the river, June 25 (284).

Sitanion elymoides Rafin. (*Elymus sitanion* Schultes).

Colorado: Georgetown, occasional in the mountains, August 17 (612), common at roadsides, August 20 (2414); Idaho Springs, common on hillsides in the canyon, August 27–28 (717, 2497); Boulder, hillsides, not common, September 3 (2509).

Wyoming: Wamsutter, dry soil near the railway, June 24 (280½, 2028); Green River, a small form, frequent on the bluffs, June 25 (283).

CYPERACEÆ.[1]

Cyperaceæ, or sedges, like rushes, grow in moist places and are commonly taken for grasses. The true sedges are abundant in bogs and meadows throughout the Rocky Mountain country, in some places making a large part of the early hay. They are inferior, however, to some of the grasses.

Cyperus schweinitzii Torr.

Colorado: Meadow Park, rare, here and there on the hillsides, August 15 (2362).

Scirpus americanus Pers.

Nebraska: North Platte, common, September (2522).
Montana: Townsend, common in a meadow near a pond, July 15 (2153).

Scirpus lacustris L.

Montana: Madison River, July 23 (2277); Townsend, common in water, in meadows, July 15 (397, 2148); Logan, common in wet places in meadows, July 27 (521).

Scirpus microcarpus Presl.

Montana: Dillon, common near water, July 2 (2083); Logan, in wet meadows, July 27 (520); Manhattan, in wet thickets, July 17 (429); Townsend, near the Missouri River, July 15 (2165).

Scirpus pauciflorus Lightf.

Colorado: Georgetown, common near water with *Eleocharis acicularis*, August 17 (2408).

Eleocharis acicularis R. & S.

Colorado: Georgetown, common in wet places, August 17 (2407).
Montana: Manhattan, bottom of a dry ditch, July 17 (2206).

Eleocharis palustris R. & S.

Nebraska: North Platte, wet meadows along Fremont's Slough, in many places constituting the bulk of the hay, June 21 (2026).
Montana: Manhattan, July 17 (408, 2208); Dillon, sandy places near the river, scarce, July 2 (2079); Townsend, common in wet places, July 15 (2157).

Eleocharis palustris R. & S. (?)

Wyoming: Green River, meadow near the river, June 25 (2040).

Carex acutina Bailey (?)

Colorado: Georgetown, in a "draw" at south end of Clear Lake, August 17 (2377); Silver Plume, around springs near brook, August 21 (2463).

Carex alpina Swartz.

Colorado: Georgetown, near Clear Lake and along a brook in the canyon, August 17 (2368, 2373); Idaho Springs, rare, August 21 (2430).

Carex athrostachya Olney.

Wyoming: Green River, in a "draw," June 25 (2032).
Montana: Bozeman, common in meadows, July 22 (455, 2216).

Carex atrata L.

Colorado: Silver Plume, along brook, common, August 21 (2436, 2461).

Carex aurea Nutt.

Montana: Manhattan, dry prairies, common, July 17 (2205); Bozeman, near Mystic Lake, July 25 (2240).

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[1] *Cyperus*, *Eleocharis*, and *Scirpus* determined by Dr. N. L. Britton; *Carex* determined by Prof. L. H. Bailey.

Carex canescens L.

Montana: Bozeman, rare, low grounds around Mystic Lake, July 25 (480, 2235).

Carex canescens alpicola Wahl.

Montana: Bozeman, east side of Mystic Lake, not common, July 25 (2239).

Carex crawei Dewey.

Nebraska: North Platte, islands in the Platte River, June 21 (274, 2021).

Carex deflexa media Bailey (Mem. Torr. Club, **1**:43, 1889).

Colorado: Silver Plume, common, moist mountain slopes, August 21 (669, 2416).

Carex douglasii Boott.

Wyoming: Green River, common, June 25 (2036, 2038).

Montana: Logan, common in wet gravelly pastures, eaten by cattle, July 27 (502); Gallatin, common in dry meadows, July 29 (529).

Carex engelmanni Bailey (Proc. Amer. Acad., **22**:132, 1886).

Colorado: Silver Plume, August 21 (2455).

Carex festiva Dewey.

Colorado: Georgetown, near Clear Lake, August 17 (2374, 2382); Silver Plume, common near brooks, August 21 (2429, 2464, 2469).

Montana: Lima, wet meadows, not common, June 30 (2073); Bozeman, common, near Mystic Lake, July 25 (2252).

Idaho: Beaver Canyon, abundant in wet meadows, forming a considerable portion of the hay in such places, June 26 (293, 2049).

Carex festiva haydeniana W. Boott.

Colorado: Silver Plume, near brooks, August 21 (2460).

Carex festiva stricta Bailey (Mem. Torr. Bot. Club, **1**:51, 1889).

Montana: Lima, common, in moist shady places, August 5 (572½).

Colorado: Georgetown, common, meadows, August 17 (660, 2405); Silver Plume, along brooks, August 21 (2462).

Carex festiva Dewey var.

Montana: Manhattan, scattered through the woods near the river, July 17 (2186).

Idaho: Beaver Canyon, rare, in a meadow, August 7 (2333).

Carex filifolia Nutt. var.

Colorado: Silver Plume, August 21 (2451).

Carex filifolia Nutt. var.? **miser** Bailey.

Colorado: Silver Plume, August 21 (2437).

Carex filiformis latifolia Boeckl.

Wyoming: Green River, rare, in a "draw," June 25 (2037).

Idaho: Beaver Canyon, common, wet meadows, June, August (2043, 2336).

Montana: Townsend, rather common, wet meadows, July 15 (2156); Logan, very common, July (2273); Manhattan, common in the woods, July 17 (2183, 2188); Red Rock, July 1 (2090, 2093); Bozeman, July (451).

Carex hoodii Boott.

Montana: Bozeman, rather common, Mystic Lake, July 22 (486).

Carex idahoa Bailey (Bot. Gaz., **21**: 5, 1896).

Idaho: Beaver Canyon, in a meadow with *Danthonia intermedia*, August 7 (2339).

Carex incurva Lightf.

Colorado: Silver Plume, August 21 (2446).

Carex liddoni Boott.

Idaho: Beaver Canyon, among bushes, June (2058).

Carex marcida Boott.

Montana: Silver Bow, abundant in boggy places, July (355); Bozeman, common in meadows, July 22 (459); Lima, abundant in alkaline meadows, forming in some places the bulk of the hay, August 5 (571).

Carex nebraskensis Dewey.

Montana: Bozeman, abundant in a wet meadow, July 22 (461½).

Carex nebraskensis prævia Bailey (Mem. Torr. Bot. Club, **1**: 49, 1889).

Idaho: Beaver Canyon, common in wet places, June 26 (2053).

Carex nova Bailey.

Colorado: Silver Plume, common along brooks, altitude 11,000 feet, August 21 (677, 2424, 2431, 2432).

Carex parryana unica Bailey (Mem. Torr. Bot. Club, **1**: 54, 1889).

Montana: Deer Lodge, common, prairies, July 9 (2128).
Idaho: Beaver Canyon, rather uncommon, in a meadow, June 26 (2050).

Carex pratensis Drejer.

Montana: Bozeman, east of Mystic Lake, July 25 (2251).
Idaho: Beaver Canyon, in meadows, August 7 (2340).

Carex raynoldsii Dewey.

Montana: Bozeman, moist, shady places near Mystic Lake, rare, July (497, 2254).

Carex siccata Dewey.

Colorado: Georgetown, along brooks, rare, August 17 (2370).
Silver Plume, common, August 21 (2423).

Carex stenophylla Wahl.

Montana: Lima, dry meadows and prairies, furnishing some pasturage, June 30 (324, 2071); Townsend, common in dry alkaline soils, July 15 (2169½).

Carex straminea Schk.

Montana: Manhattan, woods near the river, July 17 (2187).

Carex tenella Schk.

Montana: Silver Bow, about springs, July 8 (354, 2105).

Carex tolmiei Boott.

Colorado: Silver Plume, August 21 (2447).

Carex tolmiei subsessilis Bailey (Mem. Torr. Bot. Club, **1**: 47, 1889).

Colorado: Silver Plume, common, along mountain brooks, altitude 12.000 feet, August 21 (704, 2467).

Carex trichocarpa aristata Bailey (Bot. Gaz., **10**: 294, 1885).

Montana: Dillon, common in wet places, July 2 (2086); Deer Lodge, July 9 (2120); Helena, rare, ditches near railroad track, July 12 (2146).

Carex utriculata Boott.

Montana: Dillon, common in wet places, July 2 (2085).

Carex utriculata minor Boott.

Montana: Dillon, common in wet places, "nearly or quite var. **minor**" Bailey, July (2084); Deer Lodge, very common, in wet meadows near Mystic Lake, July 25 (485, 2237, 2241).

Carex variabilis Bailey (Mem. Torr. Bot. Club, **1**: 18, 1889).

Montana: Bozeman, abundant in wet meadows, July 22 (461).

Carex variabilis Bailey (?)

Montana: Bozeman, abundant in meadows, and in places constituting the bulk of the hay, July 22 (448).

Idaho: Beaver Canyon, in meadows, common, June 26 (2046).

Carex variabilis elatior Bailey (Mem. Torr. Bot. Club, **1**: 19, 1889).

Montana: Bozeman, common around Mystic Lake, July 25 (479, 2238, 2256).

Carex variabilis Bailey, var.

Colorado: Georgetown, rare, margin of Clear Lake, August 17 (647).

JUNCACEÆ.[1]

The *Juncaceæ* or rushes, resemble grasses in their habit of growth, and are often confounded with them by farmers. They are nearly always found in wet places, where they sometimes enter largely into the wild hay. As they usually have wiry stems and leaves, they are of small economic value.

Juncus balticus Willd.

Colorado: Georgetown, common in meadows and along the borders of streams and lakes, August 17–20 (608, 648, 655, 2404).

Montana: Lima, along brooks and irrigating ditches, June 30 (2072), August 5 (2308); Deer Lodge, in very wet meadows, July 9 (2131); Melrose, in wet meadows, in some stations forming a small part of the hay, July 6 (345).

Juncus bufonius L.

Colorado: Idaho Springs, along the margins of a brook, August (743).

Utah: Echo, in Echo Canyon along a brook, growing with *Poa annua*, August 13 (2358).

Montana: Manhattan, along river banks and margins of ponds, July 17–19 (438, 2199).

Juncus longistylis Torr.

Colorado: Georgetown, in meadows, not common, August 17–20 (628, 2410); Boulder, along a brook at the entrance of a canyon, September 2 (760); Idaho Springs, occasional along brooks, August 26–28 (730).

Idaho: Beaver Canyon, frequent along the margins of mountain brooks, August 7 (582).

Montana: Manhattan, moist meadows and woodlands, July 17–19 (420, 2172, 2185); Bozeman, in meadows, July 22 (2212); Silver Bow, meadows, July 8 (2107).

Juncus mertensianus Bong.

Colorado: At the foot of Grays Peak, in wet places, scarce, August 21 (686).

Juncus nevadensis S. Wats.

Montana: Bozeman, in meadows, July 22 (2210, 2212½); Melrose, near the river, only a few specimens seen, August 1 (2292).

Juncus nodosus L.

Montana: Deer Lodge, along brooks, July 9 (2116); Manhattan, in wet meadows, July 17–19 (444, 2207); Melrose, near the river, rare, July 29 (2272).

Juncus rugelii Buchen.

Montana: Bozeman, sand bars on the east shore of Mystic Lake, July 25 (481, 2242).

Juncus subtriflorus (E. Mey.) Coville.

Colorado: Silver Plume, altitude 12,000 to 13,000 feet, August 21 (673, 700).

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[1] Determined by Mr. F. V. Coville.

Juncus tenuis Willd.

Colorado: Boulder, occasional along brooks, September 2 (762).
Montana: Manhattan, in wet meadows, common, July 17–19 (441); Bozeman, in meadows with *Juncus neradensis*, July 22 (2211); Logan, wet river banks, common, July 27 (507); Townsend, banks of the Missouri River, July 15 (2149).

Juncus torreyi Coville.

Montana: Gallatin, in wet, sandy soil, common, July 29 (533).

Juncus xiphioides montanus Engelmann.

Colorado: Idaho Springs, along the margins of a mountain brook, scarce, July 26–28 (729).
Idaho: Beaver Canyon, along brooks, August 7 (583, 2335).
Montana: Lima, around a large spring, not common, June 30 (2066); Helena, in wet places along streams, and in such places forming a small part of the hay; Manhattan, in meadows near the Gallatin River, July 17–19 (2197).

Juncoides campestre (L.) Kuntze.

Montana: Bozeman, on the east side of Mystic Lake, rare, July 25 (2255).

Juncoides parviflora (Ehrh.) Coville.

Colorado: Georgetown, along small streams, rare, August 17–21 (2372); Silver Plume, common along streams, August 21 (2426).

POLYGONACEÆ.

Polygonum sp.

Montana: Butte, common, July 31 (548). "I noticed cattle eating this in a pasture at Dillon" (Shear).

CHENOPODIACEÆ.

Eurotia lanata L. (White Sage, Winter Fat).

Montana: Melrose, on the dry bench lands, common, July 6 (361, 2114). A valuable winter forage plant, especially for sheep.

APOCYNACEÆ.

Apocynum cannabinum L. (Indian Hemp).

Montana: Logan, in low meadows along the river, common, July 27 (518). Said to be eaten by stock when cured with grass.

LEGUMINOSÆ.[1]

Leguminosæ are the clovers, peas, beans, etc., including many of our best forage plants. They are particularly rich in nitrogen. Several native species are found to be of value in the Rocky Mountain region, especially the wild clovers (species of *Trifolium*).

Thermopsis montana Nutt.

Montana: Melrose, common in wet meadows, and said to be eaten by stock when in hay; it is perhaps worth investigation, August 1 (544).

Trifolium beckwithii Brewer; (Red Wild Clover).

Wyoming: Near Green River, rare, June 25 (2047).
Montana: Dillon, frequent in irrigated meadows, July 3 (338).
Growth often quite large, and the species is apparently worthy of cultivation.

Trifolium longipes Nutt. (White Wild Clover).

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[1] Determined by Mr. C. L. Pollard.

Idaho: Beaver Canyon, common in wet meadows, June 26 (292, 2048). An excellent forage plant, worth cultivating, as it forms a dense sod and is quite luxuriant in its growth.

Astragalus adsurgens Pall.

Montana: Melrose, common in meadows, August 1 (535). Perhaps of some value for forage.

Astragalus bisulcatus A. Gray.

Montana: Dillon and throughout the Beaverhead Valley, in irrigated meadows, common, August 3 (551).

Astragalus diphysus A. Gray.

Montana: Lima, on moist mountain sides, scarce, August 5 (558).

Astragalus flexuosus Dougl.

Idaho: Beaver Canyon, common in mountain woods, August 7 (577).

Astragalus hypoglottis L.

Montana: Melrose, in moist, sandy meadows, common, August 1 (539).

Astragalus mortoni Nutt.

Colorado: Georgetown, in meadows, frequent, August (629, 630).

Astragalus sp.

Idaho: Beaver Canyon, on the mountains, frequent, August 7 (579).

Oxytropis deflexa DC.

Colorado: Georgetown, in moist, gravelly soils, common, August (658).

Oxytropis splendens Dougl.

Colorado: Georgetown, in meadows, common, August (634).

Vicia americana linearis S. Wats.

Montana: Deer Lodge, in meadows, common, July 9 (362, 2118).

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BULLETIN No. 6.

U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF AGROSTOLOGY.

[Grass and Forage Plant Investigations.]

GRASSES AND FORAGE PLANTS

OF THE

DAKOTAS.

BY

THOMAS A. WILLIAMS.

PREPARED UNDER THE DIRECTION OF THE AGROSTOLOGIST.

WASHINGTON:

GOVERNMENT PRINTING OFFICE.

1897.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF AGROSTOLOGY,
Washington, D. C., December 8, 1896.

SIR: I have the honor to transmit for publication as Bulletin No. 6 of this Division a report upon the grasses and forage plants and forage conditions of the Dakotas, based upon the work of the field agents in those States during the past season and upon the observations made by Mr. T. A. Williams, assistant in the Division, who has compiled the report. Mr. Williams has spent several years in South Dakota and become personally familiar with much of the territory covered by the report. The grass and forage problem of both Dakotas is an exceedingly important one, and this report can not fail to be of great interest not only to the farmers and landowners of those States, but also to those living throughout a large portion of the Northwest where similar conditions prevail. The work in North Dakota was chiefly performed by Mr. M. A. Brannon, who visited various parts of the State under a commission from the Department, and whose notes and observations are scattered through various parts of the report. Messrs. E. N. Wilcox and David Griffiths assisted in the work done in South Dakota, Mr. Wilcox working under a commission for two months and Mr. Griffiths for a shorter period.

The report is divided into three parts, the first embracing general notes upon the forage conditions in the Dakotas; this is followed by an alphabetical and descriptive list of the grasses and forage plants of those States, in which are embodied notes of economic interest; the third part, which is addressed to botanists, contains a classified list of the grasses and forage plants collected or observed by the field agents and by Mr. Williams, specifying localities and introducing occasional notes of botanical interest.

Respectfully,

F. LAMSON-SCRIBNER,
Agrostologist.

Hon. CHAS. W. DABNEY, Jr.,
Assistant Secretary.

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GRASSES AND FORAGE PLANTS OF THE DAKOTAS.

GENERAL NOTES ON THE FORAGE CONDITIONS IN THE DAKOTAS.[1]

FEATURES OF THE FARMING AND STOCK-RAISING REGIONS.

The distinctively farming and stock-raising regions of the Dakotas are separated by more or less widely differing geological and meteorological conditions. In North Dakota the lands drained by the Red River of the North, the James River, and the Turtle Mountain slope of Mouse River are especially adapted to general agriculture. The rainfall, temperature, and character of the soil make this whole district peculiarly favorable to the growth of small grains.

These lands include about one-third of the entire State, and are given over chiefly to the growing of wheat, though other small grains are grown in large quantities. Nearly all varieties of flint corn and the early varieties of dent do well in this region, and many varieties which will not ripen seed on account of the shortness of the season can be profitably grown for forage. The straw from the fields of wheat and other small grains furnishes an almost inexhaustible supply of "roughness" for stock feeding. Root crops are easily grown, and are fed with the straw and the various by-products of small grain to a great advantage.

In South Dakota the lands adapted to general agriculture are those drained by the Sioux and James rivers, those of the Big Stone Basin, the lower Missouri Valley, and the rich valleys of the Black Hills region.

While, as with North Dakota, a considerable portion of these lands is devoted chiefly to wheat raising, many of them are well adapted to the growing of corn, flax, and other crops, and diversified farming is becoming more and more popular each year. Excellent crops of corn are grown in the lower Missouri Valley, the Sioux Valley, and the Big Stone Basin.

During the past few years a great many creameries have been established in various parts of the State, and this industry is being carried on with a high degree of success. The excellent quality of the native forage enables the creameries to send out such a fine product that Dakota butter is becoming famous and commands high prices in the markets.

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[1] What is said here will apply to southwestern Minnesota, northwestern Nebraska, eastern Montana, and northeastern Wyoming.

THE NATIVE GRASSES.

As a consequence of the extensive breaking up of the virgin soil in the agricultural regions, many of the native grasses have been restricted to limited areas, which are usually too broken or too wet for cultivation. The principal native hay grasses are Big Blue-stem, Bushy Blue-stem, Switch-grass, Western Wheat-grass, Western Quack-grass, Slender Wheat-grass, Fowl Meadow-grass, Cord-grass, Wild-rye, the Blue-joints, and the various species of *Stipa*, while these grasses, with the Gramas, Buffalo-grass and Prairie June-grass, furnish most of the grazing.

With the exception of the Black Hills region of South Dakota, the immense tract of land west of the one hundred and first meridian to the Rocky Mountains is devoted almost exclusively to stock raising. In each of the Dakotas it includes two regions of very different character; one consisting of a broad rolling prairie known as the "range" and the other the famous Bad Lands. The latter region consists of a wide area of land broken up by excessive erosion into valleys and basins of various sizes alternating with hills or buttes, the sides of which are usually so steep and so unstable that few plants can grow upon them. The flat tops of the buttes and the bottoms of the valleys and basins are usually covered with a characteristic growth of vegetation of which the grasses form by far the greater part.

The principal grasses of the stock-raising regions are the Gramas, Buffalo-grass, Salt-grass, the Blue-joints, the Sand-grasses, Western Wheat-grass, Western Quack-grass, Needle-grass, and Feather Bunch-grass. Western Wheat-grass and Western Quack-grass furnish most of the hay, except in the moister bottoms, where the Blue-joints, Big Sand-grass, and the Cord-grasses are more or less abundant.

Overpasturing in times of drought is killing out many of the most valuable grasses here as well as elsewhere, and unless this practice is abandoned permanent injury will result to this, one of the most important of the natural resources of the Northwest.

The great value of this natural forage is evident when we look at the freight records of the various railroads and see the thousands of carloads of stock annually shipped from this region which are produced with no other feed than that growing naturally on the prairies. From Dickinson alone there were shipped 2,300 carloads off at cattle within ninety days during the summer and early autumn of 1895.

It is very important that every possible effort should be made to preserve the native grasses. They are naturally adapted to the conditions which prevail in the region, and it is quite improbable that introduced forms can be had to take their places satisfactorily, at least for years to come. "That some of the native forms flourish under conditions that would kill the common cultivated ones is seen by the situation in Stark County, N. Dak. At Dickinson, the Weather Bureau reports for 1895 show a rainfall of 11.75 inches. Of this amount 5.75 inches fell in June and July. The small precipitation of 0.64 inch in the three months

of August, September, and October favors the important process of curing on the ground. This enables thousands of cattle to live during the winter on the nutritious forage furnished by this method of curing the grasses which grow at this point" (Brannon). Such a climatic condition would soon destroy the ordinary cultivated grasses, but the native species have flourished under it for centuries, and there is no reason why they should not continue to do so and still yield plenty of forage, if properly handled.

THE IRRIGATION PROBLEM.

"The successful solution of the irrigation problem in the Dakotas would be of great value to the grazing as well as to the farming interests. In North Dakota an abundance of good artesian water can be secured by boring from 90 to 260 feet at many places in the eastern part of the State, but in the middle and western portions the artesian supply is to be found from 1,000 to 3,000 feet below the surface, and can not be certainly secured at even 3,000 feet in many places. There is considerable hope of irrigating successfully from surface wells from 30 to 90 feet deep which afford a large supply of good water. These wells may be operated by windmills at small expense" (Brannon). One of the most serious difficulties in the way of successful irrigation is a lack of sufficient capital on the part of the farm owners to put down good wells, build ditches and reservoirs, and keep up other necessary expenses until the farm is placed upon a paying basis. Another trouble is the lack of proper experience in handling the water after it is ready to turn on the land.

Experience has shown that many of the most valuable of the native grasses are very much benefited by a judicious application of even a small amount of water. As a rule there is sufficient rainfall to give the grasses a good start in the spring, and if enough water could be had to keep up a strong growth when the dry, hot summer weather comes on, an abundant forage crop would be assured.

In South Dakota, flowing wells can be had at varying depths throughout the James Valley, a portion of the Missouri Valley and of the Big Stone Basin. That excellent crops can be grown under irrigation from these wells is being proved by the State experiment station on the Hunter farm at Mellette, as well as by many private individuals in various parts of the artesian regions.

CONDITIONS IN THE ARTESIAN BASIN.

The following, taken from Mr. Wilcox's report, gives an account of the forage conditions in the artesian basin:

On the 17th of August I left Brookings County and went west into the artesian basin of the James River Valley, stopping first at Iroquois. The country from Brookings to Iroquois is a rolling prairie. The principal grasses are Little Blue-stem, Big Blue-stem, Western Wheat-grass, Porcupine-grass, Switch-grass, Big Sand-grass,

Wild-rye, and Spiked Muhlenberg's-grass. Along the artesian well drain at Iroquois *Sporobolus asperifolius*, Salt-grass, Western Wheat-grass, Wild-rye, Switch-grass, Cord-grass, Tall Grama, and very large specimens of Barnyard-grass abound. Blue Grama and Buffalo-grass are common on the prairies.

From Iroquois south to Vilas there is no perceptible difference in the flora.

From Vilas I went westward through Miner and Sanborn counties, and into northwestern Aurora County. Near Artesian City, in Miner County, I crossed a large "Gumbo flat," on which little grew except Salt-grass, Saltbushes, and Western Seablight (*Suæda depressa*). At Artesian City water is obtained at less than 100 feet, and the wells have been flowing for eight or nine years. The ordinary prairie grasses were common, and Slough-grass (*Beckmannia erucæformis*), was beginning to appear in the ditches and ponds.

From Artesian City westward the country grows drier and drier, except a strip of 10 or 12 miles on each side of the James River. Where I crossed the river near Forestburg, a herd of about 400 cattle had been pastured and were in fine condition.

The pasture was composed of native grasses. Big Sand-grass, Switch-grass, Tall Grama, Blue Grama, Western Wheat-grass, and Wild Vetch (*Hosackia purshiana*) grew in large quantities, but had all been fed close to the ground. The only plants which did not seem to have been eaten were *Cleome integrifolia* and several species of Golden Rod. There were acres of the *Cleome*, and the masses of rose purple flowers were a beautiful sight.

At Woonsocket several large artesian ponds had been drained and the vegetation cut for hay, but it did not seem to be of much value, as it was largely made up of species of *Bidens*, *Eleocharis*, and *Scirpus*. Barnyard-grass made the most valuable part of the hay.

At Letcher there were several large ponds fed by the artesian well. On the margins of these ponds were growing Reed-grass, Slough-grass, Barnyard-grass, Switch-grass, Long-leafed Prairie-grass, Cord-grass, and sparingly, Rice Cut-grass (*Homalocenchrus oryzoides*).

From Letcher westward Long-leafed Prairie-grass, Southern Poverty-grass, *Sporobolus brevifolius*, and *S. cryptandrus* became more and more common. Buffalo-grass grew in considerable quantity; Wild Crab-grass was occasionally seen, and also the low-growing Cacti (*Mamillaria viripara*, *M. missouriensis*, and *Opuntia fragilis*). The grasses seemed to gradually decrease in size, and a relatively larger amount of seed was produced by each species than farther eastward, although, owing to dry weather, much of the seed did not mature.

Northern Aurora County is in the western part of the James River Valley close to the Wessington Hills, which divide the small streams flowing into the James River from those flowing into the Missouri. For nine or ten years the rainfall here has been scanty and much of the land has, to use the local expression, "gone back," i. e., been broken up and cultivated for two or three years, then deserted and allowed to grow up to grass and weeds. This would make better hay-land if the Russian Thistle and Gum Weed (*Grindelia squarrosa*) were not present in such large quantities. The latter weed is spreading over the whole country, prairies, pastures, and all uncultivated land. The woody, sticky stems cause considerable trouble in haying season, but are worst in the pastures, where the resinous exudation sticks to the faces of cattle, horses, and sheep, causing eyes and nostrils to become inflamed and sore. The plant has the one redeeming feature of being good to burn, and is being collected in considerable quantity for winter fuel.

The Wessington Hills have an elevation of two or three hundred feet above the surrounding country. There were formerly many small lakes among these hills, but they are now nearly all dry. The Firesteel Creek heads in the Wessington Hills, and runs southeast about 50 miles, where it enters the James River near Mitchell. Along the banks of the Firesteel grow *Petalostemon violaceus*, *P. candidus*, *P. multiflorus*, *Amorpha canescens*, *A. microphylla*, *Psoralea argophylla*, *P. esculenta*, *Astragalus caryocarpus*, *A. plattensis*, *A. adsurgens*, *A. racemosus*, *A. lotiflorus*, *A. missouriensis*, *A. canadensis*, *Oxytropis lambertii*, *Glycyrrhiza lepidota*, and such grasses as Big Blue-stem,

Little Blue-stem, Bushy Blue-stem, Tall Grama, Blue Grama, Long-leafed Prairie-grass, Southern Poverty-grass, Switch-grass, Western Beard-grass, Wild-rye, Lyme-grass, Western Wheat-grass, Spiked Muhlenberg's-grass, Mexican Wood-grass, Slender Wheat-grass, Buffalo-grass, Cord-grass, Big Sand-grass, Montana Sand-grass, *Sporobolus brevifolius, Panicum depauperatum,* and *Homalocenchrus virginicus.*

In the dry sloughs of the prairie, grow Blue-joint, Reed Canary-grass, Cord-grass, and Switch-grass.

In the "burn outs," "blow outs," or "buffalo wallows" grow *Sporobolus cryptandrus, Leptochloa fascicularis,* Salt-grass, Long-leafed Prairie-grass, Buffalo-grass, *Atriplex argenteum, Plantago patagonica,* vars. *gnaphalioides* and *nuda, P. pusilla,* and *Marsilea vestita.* As the "buffalo wallows" require much work and time to make them productive when cultivated, they are usually pastured. All the above-mentioned plants are eaten by stock.

One of the farmers here had about a quarter of an acre of Smooth Brome-grass grown from seed sent out for trial by the State experiment station. The grass was growing well and maturing a good crop of seed. In the town of Plankinton was a small field of Timothy and Red Clover which had been watered thoroughly during the dry weather. When I saw it about the middle of August, one fine crop of early hay had been cut and a second, heavier crop, was just being gathered.

The artesian ponds at Plankinton contained *Typha latifolia, Sparganium eurycarpum, Scirpus robustus, S. lacustris, S. fluviatilis, Leptochloa fascicularis, Beckmannia erucæformis, Calamagrostis canadensis,* and *Spartina cynosuroides,* while on the margins grew Big Blue-stem, Barnyard-grass, Switch-grass, Long-leafed Prairie-grass, Wild-rye, Tall Grama, Western Wheat-grass, and Squirrel-tail-grass.

In concluding this part of my report I might say that the most interesting things which I have observed were the climatic differences which occurred in traveling a distance of only 100 miles, the corresponding effects of these changes on the flora of the regions visited, and, in the drier parts of the State, the marked influence of irrigation on all kinds of vegetation.

In the eastern part of the State good crops are nearly always secured, but owing to the low price of grain, farmers are largely going into dairying. In this section it costs from 75 cents to $1.25 per month to pasture cattle and horses. The winters are nearly always snowy and stock must be stabled and fed for a long time.

In northern Aurora County, where for some time there has been so little rain that farmers have secured a good crop only once in four or five years unless they irrigated, horses and cattle are pastured from May to November for $2 per head. There is very little snow in winter, and cattle and horses live upon the open prairies. I saw numbers of young well-bred horses which were in fine condition and yet had been fed neither hay nor grain, nor had they been stabled for over two years. Cattle were fatter than any I saw in Iowa or Illinois, although the prairie grass looked scorched and dry.

In general, irrigated plants are larger, they grow and remain green for a longer period of time, and relatively they produce much less seed in proportion to the stems and leaves than plants of the same species and locality under natural conditions. There is a belt of green vegetation around artesian ponds and ditches long after the plants on the prairies are dry and yellow.

I gathered mature seeds of *Beckmannia erucæformis* at Brookings before the middle of July, and four weeks later at the artesian well at Plankinton, this grass was seen in bloom.

The following forage plants are common about artesian wells: *Typha latifolia, Sparganium eurycarpum, Scirpus lacustris, Scirpus fluviatilis, Scirpus robustus, Carex douglasii, Carex straminea, Spartina cynosuroides, Phragmites vulgaris, Distichlis spicata stricta, Leptochloa fascicularis, Sporobolus longifolius, Panicum virgatum, Panicum crus-galli, Hordeum jubatum, Chætochloa glauca.*

Until recent years there was little need in either of the Dakotas of growing tame grasses, and, as is always the case, many of the first

attempts in this direction met with failure or only indifferent success. However, as the farmers are becoming more acquainted with the peculiarities of soil and climate existing in this region, better results are being obtained, and at the present time in many parts of both North Dakota and South Dakota may be found excellent pastures and meadows of tame grasses. In the rich bottom lands in the older settled regions Timothy, Red-top, Alsike, Red Clover, White Clover, Smooth Brome-grass, Blue-grass, and several of the fescues give paying crops. Millet is extensively grown in all the farming communities, and such recent introductions as Kaffir Corn, Lupines, and Sand-vetch seem likely to assume an important place among the forage crops of this region, already so bountifully supplied by nature with the "grasses of the field."

Wherever irrigation is practiced there is no difficulty in getting paying crops of such grasses as Timothy and Red-top, and it is quite certain that many other forage plants can be successfully grown in the artesian regions when the vast underground water supply can be utilized.

GRASSES AND OTHER PLANTS OF THE DAKOTAS WHICH ARE OR MAY BE OF IMPORTANCE AS FORAGE.

Agropyron.

Of the several species of *Agropyron*, or Wheat-grasses, growing in the Dakotas, Western Wheat-grass (*Agropyron spicatum*) is the most common and the most valuable. Western Quack-grass (*A. pseudorepens*) and Slender Wheat-grass (*A. tenerum*) (fig. 1) are also valuable, but are less abundant in the dry regions than Western Wheat-grass. These *Agropyrons* are plentiful both on the "range" and in the agricultural regions, and are highly valued for both hay and pasturage. They grow voluntarily on old plowings, and instead of attempting to destroy the plants, which would be difficult on account of the numerous underground stems, or rhizomes, many farmers prefer to leave such lands for meadows. The yield of hay is usually much better than on the unbroken prairie. In favorable seasons three tons per acre are often obtained from these meadows. Wheat-grass hay is one of the most nutritious grown in the Northwest. Under ordinary circumstances a Wheat-grass meadow will not give a good crop every year; usually the yield is light the third year. Many farmers overcome this trouble by harrowing or discing the meadow, which breaks up the underground stems of the grass, and a fine growth of new shoots is the result. The Wheat-grasses cure on the ground in the grazing regions and furnish a large amount of very nutritious forage during the winter. From the middle of July there is little rain in the western cattle districts, and these grasses mature early and are the chief forage plants on which thrive the choice beeves, which command fancy prices in the eastern markets. They have few equals among the grasses of the western prairies in the quantity or quality of forage produced, and should be cultivated and improved as much as possible.

Agropyron caninum. (*See* Bearded Wheat-grass.)

Agropyron divergens. (*See* Bunch Wheat-grass.)

Agropyron pseudorepens. (*See* Western Quack-grass and *Agropyron*.)

Agropyron richardsoni. (*See* Bearded Wheat-grass.)

Agropyron spicatum. (See *Agropyron.*)

Agropyron tenerum. (See *Agropyron* and Slender Wheat-grass.)

Agrostis scabra. (*See* Tickle-grass.)

Alfalfa (*Medicago sativa*).

This plant is grown in many parts of both Dakotas, but generally with indifferent success. Where irrigation is possible, better results are had. No difficulty is experienced in getting a good stand, but too often the season is unfavorable for the rapid development so necessary to the successful growing of this crop. The plants turn yellow and the first cutting is light. Where the field can be irrigated immediately on the taking off of the first crop, this trouble is not so serious. The plants are often badly affected by a fungous disease which causes the leaves to fall early, and thus much of the most valuable part of the forage is lost.

Alopecurus geniculatus fulvus. (*See* Wild Water Foxtail.)

Alsike (*Trifolium hybridum*).

This clover occurs in door yards, along roadsides, and occasionally in fields in the valleys of the Red, James, and Sioux rivers. It does well in the eastern part of South Dakota, and Professor Brannon, speaking of it in the Red River Valley in North Dakota, says "it seems to be quite hardy and would no doubt do well sown with Timothy, Orchard-grass, or Kentucky Blue-grass."

American Vetch (*Vicia americana*).

More or less abundant in the eastern part of both States, where it grows in moist places. "It is relished by all kinds of stock and furnishes considerable food," which is "considered very fattening."

Andropogon hallii. (*See* Colorado Sand-grass.)

Andropogon nutans. (*See* Bushy Blue-stem.)

Andropogon provincialis. (*See* Big Blue-stem.)

Andropogon scoparius. (*See* Little Blue-stem.)

Aristida fasciculariis. (*See* Western Beard-grass.)

Arrhenatherum elatius. (*See* Tall Oat-grass.)

Astragalus.

There are a large number of species belonging to this genus found in the Northwest. Some of them are readily eaten by stock and are highly prized by stockmen; others are so bitter and unpalatable that few animals will touch them, while still others are thought to be injurious.

Astragalus adsurgens. (*See* fig. 6.)

This species is said to be eaten readily by stock, particularly on the "range," when grasses are dry and short. This, and other small-fruited species, are known as Milk Vetch.

Astragalus bisulcatus.

One of the strong smelling species. "The plant has a rather rank taste when young, but loses this as it becomes mature, when stock readily eat both stems and leaves" (Brannon).

FIG. 1.—Slender Wheat-grass (*Agropyron tenerum*).

Astragalus caryocarpus. (*See* Buffalo Pea.)

Astragalus canadensis.

A coarse-growing species seldom eaten by stock of any kind.

Astragalus flexuosus.

In this species the stems become woody so early that it has little, if any, value as a forage plant.

Astragalus hypoglottis.

This small Milk Vetch is very abundant on our Northwestern prairies. It is relished by stock and furnishes no inconsiderable amount of forage in many localities. No good common name has as yet been given to this species. Bristly-fruited Milk Vetch would suit it very well.

Astragalus plattensis. (*See* Buffalo Pea.)

Atriplex spp. (*See* Salt-bushes.)

Avena fatua. (*See* Wild-oats.)

Avena americana. (*See* Native Meadow Oat-grass.)

Barnyard-grass (*Panicum crus-galli*).

Found more or less abundantly throughout the Northwest in fields and waste places. It makes an immense growth in rich moist soils. All kinds of stock eat it readily, either in the green state or as hay. The hay is coarse and should be cut before the stems become woody. It is becoming very abundant on waste irrigated lands, where it often reaches a height of from 4 to 6 feet. At Redfield, Iroquois, Letcher, and elsewhere in the James Valley it is one of the most conspicuous plants along ditches and about ponds fed by artesian wells. It seems probable that it could be cultivated to advantage in the artesian basin, and it should be given an extended trial (fig. 2).

FIG. 2.—Barnyard-grass (*Panicum crus-galli*).

Bearded Wheat-grass (*Agropyron richardsoni* and *A. caninum*).

These species are much more valuable for hay than for grazing, as they fruit early and produce very little growth during the remainder of the season.

Beckmannia erucæformis. (*See* Slough-grass.)

Beckwith's Clover (*Trifolium beckwithii*).

This pretty little clover is quite abundant in the upper Sioux Valley, but only in a rather limited area, and it has not been reported from any other locality in the middle Northwest. It grows in rather moist prairie meadows and along the margins of swales. In the vicinity of Brookings, S. Dak., it is very plentiful and forms an important element in the native pasturage. It may prove valuable under cultivation.

Big Blue-stem (*Andropogon provincialis*).

This is the most common blue-stem in this region. It is everywhere regarded as one

of the most valuable of the native grasses. Though it occurs in greater or less abundance on the prairies, it reaches its best development in the moist bottom lands along streams and in the lake regions. In the Sioux Valley, Red River Valley, Big Stone Basin, and lower Missouri Valley this is the most highly prized hay grass of all the native species. It is becoming more abundant as the country is settled up, and prairie fires are better controlled and the meadows given better care.

Big Sand-grass (*Calamovilfa longifolia*).

This is one of the most widely distributed grasses on the Northwest prairies. It prefers sandy soils in rather moist localities. It is one of the most conspicuous grasses of the moist runs and sandy basins of the Bad Lands, and affords a considerable amount of coarse hay. Its rigid leaves and strong-growing rootstocks make it an excellent sand binder.

Black Grama (*Bouteloua hirsuta*).

This is often found in company with Blue Grama, but is much less common and of less importance agriculturally.

Blow-out grass (*Muhlenbergia pungens*).

This grass is apparently rare, and is of little value for forage, as stock seldom eat it, on account of its rigid, pointed leaves. It grows about "blow-outs," in dry, sandy soil, and is of considerable value as a sand binder.

Blue-eyed grass (*Sisyrinchium angustifolium*).

This is a small grass-like plant belonging to the Iris family, and is quite abundant in the eastern part of both States. It forms clusters of leaves and stems, which are liked by all kinds of stock.

Blue Grama (*Bouteloua oligostachya*).

This is the most common grama in the Northwest. It is very abundant on the ranges, and ranks among the most important plants for grazing purposes in those regions. It "sun cures," and not only serves for forage in summer and fall, but continues to be one of the main food supplies in winter. Together with Black Grama, it is often called "Buffalo-grass." Cattlemen hold both grasses in high esteem (fig. 3).

FIG. 3.—Blue Grama (*Bouteloua oligostachya*).

Blue-joint (*Calamagrostis canadensis* and *C. scribneri*).

The Blue-joints are abundant throughout in moist meadows and pastures. They produce an excellent growth of root leaves, and hence are heavy yielders. The hay, though often coarse, is almost equal to Timothy in nutritive qualities.

Bog-rush (*Juncus* spp.).

Several species of Bog-rush occur in greater or less abundance. All are eaten by stock to some extent, and they usually form a small part of the hay obtained from low boggy places.

Bouteloua hirsuta. (*See* Black Grama.)

Bouteloua oligostachya. (*See* Blue Grama.)

Bouteloua racemosa. (*See* Tall Grama.)

Bromus ciliatus. (*See* Swamp-chess.)

Bromus inermis. (*See* Smooth Brome-grass.)

Bromus kalmii. (*See* Kalm's Chess.)

Broom-corn Millet (*Panicum miliaceum*).

This millet is quite extensively cultivated throughout the Northwest and is especially valuable because of the short season which it needs to reach maturity and because of the large yield of seed. As a hay plant it is much less valuable than the common millet. The seed has been used to very good advantage for fattening hogs and feeding other farm animals. In some parts of the Northwest it is known as Hog Millet. Enormous yields of seed have been obtained in the eastern parts of the Dakotas. The seed is fed to best advantage when crushed or ground and it is often soaked for hogs. Though it is not the equal of corn as a food for fattening animals it may, under certain circumstances, very well take the place of it. The plant stands drouth well, grows rapidly, and makes an excellent catch crop.

Buffalo Pea (*Astragalus caryocarpus* and *A. plattensis*).

These plants are more or less abundant on dry prairies throughout the whole Northwest. *Astragalus caryocarpus* is by far the commonest of the Buffalo Peas. It is eaten by cattle and sheep, and the latter are said to be particularly fond of the fleshy plum-like pea-pods. These pods are also sometimes used as an article of human diet.

FIG. 4.—Buffalo-grass (*Bulbilis dactyloides*).

Buffalo-grass (*Bulbilis dactyloides*).

This famous range grass is still quite abundant in the regions west of the James Valley in both Dakotas. It is by no means as rare as most people suppose, being frequently overlooked on account of its similarity to certain of the grama-grasses and because it seldom fruits in any great quantity. The dense mats formed by its curly leaves and creeping stems may be distinguished from the surrounding vegetation on account of their paler color. Stock are very fond of this grass, and especially in winter prefer it to any other native forage (fig. 4).

Bunch Wheat-grass (*Agropyron divergens*).

"A bunch grass of the Bad Lands. It furnishes a large amount of excellent forage. The leaves remain green long after the flowering season and are much relished by all kinds of stock" (Brannon).

Bushy Blue-stem (*Andropogon nutans*).

This grass is scarcely less valuable than Big Blue-stem. It thrives on rather drier soil than that species, and, like it, is becoming more abundant every year.

Calamovilfa longifolia. (*See* Big Sand-grass.)

Calamagrostis americana.

This grass is very common in moist meadows, particularly where the soil is sandy, and "affords a large amount of excellent hay," if cut in proper season. It is called "Sand-grass" and "Yellow-top" in some parts of the Northwest.

Calamagrostis canadensis. (*See* Blue-joint.)

Calamagrostis montanensis. (*See* Montana Sand-grass.)

Calamagrostis scribneri. (*See* Blue-joint.)

Carex spp. (*See* Sedges.)

Cenchrus tribuloides. (*See* Sand-bur.)

Chætochloa glauca. (*See* Yellow Foxtail.)

Chætochloa italica. (*See* Millet.)

Chætochloa viridis. (*See* Green Foxtail.)

Colorado Sand-grass (*Andropogon hallii*).

This is very much like Big Blue-stem in appearance, but is probably less valuable for forage. It grows in sandy soils, and, because of its stout rootstocks, which are often several feet in length, it is a good sand binder.

Cord-grass (*Spartina cynosuroides*).

A common grass in sloughs and wet places throughout the Northwest. It, together with certain rushes and sedges, makes up the greater part of the early hay cut in this region. The hay is coarse but nutritious, and is relished by stock. "The stems contain considerable sugar, and are eaten readily by stock" if the hay has been cut before they become too tough and woody. It is extensively used as a thatch for roofs of sheds and stables, and also for fuel. When made into firm "twists," it makes a fair substitute for wood, and often is one of the principal sources of warmth for people who through lack of funds or in times of scarcity can not get a sufficient supply of wood and coal.

Cow Pea (*Vigna catjang*).

Occasional under cultivation. At Brookings and Mellette, S. Dak., this plant made an excellent growth the past season, but failed to ripen seeds. It may prove to be a good plant for soiling purposes.

Cyperus spp.

There are several species of this genus which enter more or less into the native forage supply of this region. They grow in wet soil, and seldom occur in very great quantity. *Cyperus erythrorhizos* and *C. speciosus* are the most important species as far as the forage question is concerned.

Cyperus schweinitzii.

This sand-loving cyperus is probably of little importance as a forage plant, except, perhaps, in the sandy bottoms along streams or lakes. "Its chief use is for holding the sand and preventing the drifting, which is excessive in some localities" (Brannon).

Dactylis glomerata. (*See* Orchard-grass.)

Dalea alopecuroides.

This leguminous plant is quite abundant in the lower Missouri Valley region. It prefers dry sandy soils, and yields considerable forage, which stock eat quite readily. In some localities it is highly prized by stockmen.

Deschampsia cæspitosa. (*See* Tufted Hair-grass.)

Desmodium canadense.

This is a common plant in low pastures and along the borders of woods. It grows 3 to 5 feet high, and produces a large number of leaves, which are relished by cattle and sheep. It goes by the name of "Meadow trefoil" or "Stick-seed."

Distichlis spicata stricta. (*See* Salt-grass.)

Early Bunch-grass (*Eatonia obtusata*).

This is an excellent pasture grass because of its earliness and of the fine quality of the forage produced. It is not often present in any great quantity, however, but is most abundant in the moister regions, where it is much prized as an early pasture grass.

Eatonia nitida. (*See* Short-leafed *Eatonia.*)

Eatonia pennsylvanica.

This grass flourishes in moist meadows and open woods, but forms too small a part of the forage to be of much importance for either pasturage or hay. Like early bunch grass, however, the forage is of excellent quality.

Eleocharis spp. (*See* Spike-rush.)

Elymus canadensis. (*See* Wild-rye.)

Elymus macounii. (Macoun's Wild-rye.)

Elymus virginicus. (*See* Lyme-grass.)

Eragrostis major. (*See* Stink-grass.)

Eragrostis purshii. (*See* Southern Spear-grass.)

Eriocoma cuspidata. (*See* Indian Millet.)

Eurotia lanata. (*See* Winter Fat.)

False Buffalo-grass (*Munroa squarrosa*).

A low-growing grass of dry, sandy soils. Stock seldom eat it on account of its harsh stems and rigid, pointed leaves. It is said that the agricultural ants collect the seeds of this grass for their store of winter food.

False Redtop. (See *Poa flava* and *Panicum virgatum.*)

Feather Bunch-grass (*Stipa viridula*).

Very abundant in dry, sandy soils, furnishing a large amount of forage. The "spears" of this grass are not so injurious as are those of the other two species of *Stipa* occurring in the Dakotas.

Festuca elatior. (*See* Tall Fescue.)

Festuca elatior pratensis. (*See* Meadow Fescue.)

Festuca octoflora. (*See* Slender Fescue.)

Festuca ovina. (*See* Sheep's Fescue.)

Fine-topped Salt-grass (*Sporobolus asperifolius*).

More or less abundant in saline soils in the western part of the Dakotas. Cattle are not very fond of it, but will eat it when other forage is scarce, and as it thrives on soils that will grow but few other grasses it may be valuable in some localities.

Floating Meadow Foxtail. (*See* Wild Water Foxtail.)

Fowl Meadow-grass (*Poa flava.*)

This is one of the most valuable of the native species of *Poa.* It occurs in both dry and moist soils, but reaches its best development in the latter. In many localities in the eastern part of both States it furnishes a large portion of the forage. It is particularly valuable on lowland meadows that are occasionally overflowed. In the Sioux Valley at Brookings, S. Dak., this grass sometimes furnishes 50 per cent of the hay cut from the meadows near the river.

Glyceria airoides.

Grows in old lake beds and in sandy alkaline basins. It is most abundant in the Bad Lands. In the latter region it often furnishes considerable forage.

Glyceria aquatica. (*See* Reed Meadow-grass.)

Glyceria fluitans. (Floating Manna-grass.)

Glyceria nervata. (*See* Nerved Manna-grass.)

Great Bulrush (*Scirpus lacustris*).

Though sometimes eaten by stock, this plant is of little importance for forage, unless perhaps, in very marshy land.

Green Foxtail (*Chætochloa viridis*).

A weedy grass, becoming more or less abundant in cultivated lands. "It grows luxuriantly on rich ground, and may be used for hay with profit if cut early." Screenings composed largely of the seeds of this and other Foxtails are often fed to calves and poultry with most excellent results.

Hairy Vetch (*Vicia villosa*). (*See* Sand Vetch.)

Holy Grass. (*See* Sweet-grass.)

Hordeum jubatum. (*See* Squirrel-tail.)

Hordeum nodosum. (*See* Wild Barley.)

Hosackia purshiana. (*See* Wild Vetch.)

Hungarian Grass (*Chætochloa italica germanica*). (*See* Millet.)

Indian Millet (*Eriocoma cuspidata*).

This is one of the bunch-grasses of the Bad Lands, where it is regarded as a good forage plant. After fruiting, the stems and leaves become hard and woody and then are not much eaten by stock unless better forage is scarce. However, stock are very fond of the ripened seeds, which are said to be very nourishing. It usually occurs in sterile, broken soil where but few other grasses will grow.

Indian Rice (*Zizania aquatica*).

This grass is quite plentiful in running water throughout the region east of the Missouri River. It is often so abundant in the Sioux River as to cover the entire bed of the stream for long distances. All kinds of stock eat it with relish, and cattle and horses will wade out into the water and bite off the grass down to the surface of the water. In dry seasons when the water is low the grass is cut and used for fodder. The seeds are a favorite article of food of the Indians, and are also often used by the white settlers. During their fall migrations the wild fowl come to the rice-filled streams by thousands, for they are very fond of the seeds of this grass. It is a valuable plant for use in seeding down the waters of game preserves (fig. 5).

FIG. 5.—Indian Rice (*Zizania aquatica*).

Juncus spp. (*See* Bog-rush.)

Kaffir Corn (*Andropogon sorghum* var.).

This forage plant has received considerable attention in the Dakotas during the last few years. The chief obstacles in the way of its culture have been the cold, often late springs, which kept the plants from making sufficient growth to allow the cultivation necessary to keep the weeds in check, and the short seasons, which do not allow many of the varieties to ripen seed. However, many farmers have succeeded in growing the hardier varieties with excellent results, and it is not unlikely that Kaffir Corn may soon become one of the principal

sources of the supply of coarse forage for this region. Both red and white varieties were grown very successfully on the Hunter farm at Mellette, S. Dak., the past season, as also on the station farm at Brookings, and farmers from various parts of both States give very encouraging reports of their attempts to grow this crop.

Kalm's Chess (*Bromus kalmii*).

Usually too rare to be of much importance as a forage plant. It grows in dry, open woodlands and, so far, has been found to be most abundant in the Turtle Mountain region.

Kentucky Blue-grass (*Poa pratensis*).

This grass is pretty generally distributed over the eastern portion of both Dakotas, either in the wild or in the cultivated state. "It makes the best development in rich moist meadow lands, where it yields well in both hay and pasturage. It matures early and does well when mixed with other grasses, and hence is valued for upland pastures." It is an excellent grass for use in reseeding worn-out places in the native pastures. The dry weather of midsummer often causes it to dry up considerably, but stock like it even in that condition. It starts early and also makes a good growth after the September rains, and hence forms an important element in the forage of the season.

Koeleria cristata. (*See* Prairie June-grass.)

Lathyrus palustris. (*See* Native Meadow Pea.)

Lathyrus venosus.

A very pretty native pea growing on shaded banks, said to be "eaten greedily by cattle and hogs."

Little Blue-stem (*Andropogon scoparius*).

This blue-stem is found throughout the Northwest on dry prairies and hillsides. Early in the season it is eaten by stock, but it soon becomes so tough and woody that the animals will not eat it unless forced to do so. The dense clusters of woody stems are very difficult to cut, and will almost ruin an ordinary mower if much of the grass is present in the hay meadow. In the Bad Land "basins" it is the most conspicuous grass seen, and forms very dense bunches of tough, wiry stems seldom eaten by cattle or horses.

Long-leafed Prairie-grass (*Sporobolus longifolius*).

More or less abundant in rather dry, sandy meadows and along hillsides and edges of fields. It yields a large amount of forage, which is eaten by stock while young and fresh or when properly cut and cured. Late in the season it develops so much woody tissue in the stems and leaves that neither cattle nor horses will eat it unless forage is scarce. It is possible that the plant could be utilized in the manufacture of paper, mats, etc., as the leaves are long and contain such an abundance of fibrous tissue. The grass flourishes in the vicinity of the waste water from artesian wells.

Lyme-grass (*Elymus virginicus*).

More or less abundant in open woods and dry meadows. It is an excellent grass for early pasturage, and also furnishes a considerable amount of hay in certain localities. It is frequently badly affected with ergot, and then the hay is injurious to stock unless cut early. In the lower Sioux and Missouri valleys this grass, together with Wild-rye (*Elymus canadensis*), furnishes much of the forage in woodland pastures.

Meadow Fescue (*Festuca elatior pratensis*).

This fescue has given better results than any other large fescue tried in the Northwest. It thrives best on rich, moist bottom lands, and is an excellent grass for mixtures for permanent meadows and pastures. It does not succeed well on dry upland or sandy soils, but can be used to advantage in seeding down sloughs or lake beds that have been drained.

Meadow-rush (*Scirpus atrovirens* and var. *pallidus*).

Wet sloughs. It is readily eaten by stock and occasionally occurs in considerable quantity in "Slough-grass hay."

Meadow Trefoil. (See *Desmodium canadense.*)

Medicago sativa. (*See* Alfalfa.)

Melica hallii.

A fescue-like grass found on dry rolling prairies. Probably of little importance as a forage.

Melilotus alba. (*See* White Sweet Clover.)

Mesquite. (See *Bouteloua* spp.)

Mexican Wood-grass (*Muhlenbergia mexicana*).

A common grass in moist soil in open woods and thickets. It yields considerable forage, which is very nutritious, and in certain localities is of some importance in woodland pastures.

Milk Vetch (fig. 6). (See *Astragalus adsurgens.*)

FIG. 6.—Milk Vetch (*Astragalus adsurgens*).

Millet (*Chætochloa italica* and var. *germanica*).

This is one of the widest-grown hay crops in the Northwest. It thrives on a variety of soils and gives abundant crops of coarse but nutritious forage. The best quality of hay is obtained by cutting just before blossoming, but after the heads are well formed. It gives better results when fed with other forage than when fed alone. It is a common practice to give one feed per day of millet hay and one or two of timothy, prairie hay, or corn fodder. Millet requires but a short time in which to reach maturity, and hence is an excellent crop for the Northwest, where the seasons are never very long at best. The fact that it can be sown late in the spring and still mature a good crop makes it a good plant to use in subduing weeds. Many different varieties are grown, but the forms of the so-called "German" millets, as golden millet and Dakota millet, are preferred by farmers generally. Hungarian grass (var. *germanica*) is often grown, but is not prized as highly as either the "common" or the "German" millet on account of the lighter yield and a tendency to remain in the soil for some years as a weed.

Montana Sand-grass (*Calamagrostis montanensis*).

A low-growing grass, inhabiting dry sandy soils. The root leaves are usually produced in abundance and "furnish considerable pasturage early in the season and then 'sun-cure' on the buttes and hill-slopes, affording a large amount of winter feed."

Muhlenbergia mexicana. (*See* Mexican Wood-grass.)

Muhlenbergia pungens. (*See* Blow-out grass.)

Muhlenbergia racemosa. (*See* Wild Timothy.)

Munroa squarrosa. (*See* False Buffalo-grass.)

Narrow-leafed American Vetch (*Vicia americana linearis*).

This is a low-growing vetch which is found in dry soil in fields and waste places. It enters quite largely into the forage of certain localities. It spreads rapidly in poorly cultivated fields, and hence is sometimes regarded as a weed.

Native Meadow Oat-grass (*Avena americana*).

"A bunch grass of the high prairies which is not widely distributed in North Dakota." When present, it furnishes valuable forage.

Native Meadow Pea (*Lathyrus palustris*).

Often quite abundant in moist meadows and edges of thickets. It is often present in considerable quantity in lowland hay and undoubtedly increases the feeding value materially.

Needle-grass (*Stipa comata*).

Abundant in dry upland prairie soil in the central and western parts of the Dakotas. It often forms a large percentage of the prairie hay. It is not cut until the "needles" have fallen, in order that they may not injure stock. In many localities on the high prairies between the James and Missouri rivers this grass often furnishes 50 per cent or more of the native hay.

Nerved Manna-grass (*Glyceria nervata*).

Abundant in shallow water and boggy meadows throughout the Northwest. It affords a large amount of excellent forage and forms an important element in lowland pastures and meadows. The seeds are a favorite food of wild fowl. This species, like Reed Meadow-grass, can be used to advantage in seeding down old sloughs or lake beds.

Old Witch-grass (*Panicum capillare*).

Common throughout the Northwest on waste and cultivated lands. Usually regarded as a weed, but often affords considerable forage in the fall, especially in stubble fields. The panicles break loose in autumn after the manner of Tickle-grass and are blown about by the wind, often in such numbers as to be quite troublesome.

Orchard-grass (*Dactylis glomerata*).

Occasional in cultivation and as an escape. It seems to be quite hardy in some localities, and should be cultivated more widely in this region. "This plant has been cultivated to some extent in North Dakota. It is reported to do well if plenty of seed is sown early in the spring. It withstands our summers better than timothy and would evidently pay well to use with red clover for meadows" (Brannon).

Oryzopsis micrantha.

This grass is quite generally distributed throughout the central and western parts of the Dakotas. It grows in dry sandy soil, and, though tough and wiry, is nutritious, and is considered a valuable grass. It is sometimes called Indian Millet, but a better common name would be Small Indian-millet, which would distinguish it from *Eriocoma*.

Oxytropis lambertii.

This plant is generally classed as one of the "loco weeds," and most observers agree in saying that stock will not eat it unless forced to do so by scarcity of forage; but according to Professor Brannon, "it is eaten readily by stock, and is present in sufficient quantities to rank with the valuable native upland forage plants."

Panicum capillare. (*See* Old Witch-grass.)

Panicum crus-galli. (*See* Barnyard-grass.)

Panicum miliaceum. (*See* Broom-corn Millet.)

Panicum scribnerianum. (*See* Small Panic-grass.)

Panicum virgatum. (*See* Switch-grass.)

Phalaris arundinacea. (*See* Reed Canary-grass.)

Phleum pratense. (*See* Timothy.)

Phragmites vulgaris. (*See* Reed-grass.)

Poa arida. (Bunch Spear-grass.)

A native species found in rather dry meadows and swales. It is an excellent grass and is frequently present in sufficient quantity to form a considerable portion of the forage in native meadows and pastures. It is quite abundant in portions of the James and Sioux valleys, and is certainly worthy of trial under cultivation. It is one of the first grasses to start in the spring and is usually in bloom in early June (fig. 7).

FIG. 7.—Bunch Spear-grass (*Poa arida*).

Poa buckleyana.

This is one of the most valuable "Bunch-grasses" in the Northwest. It is not so abundant in the Dakotas as it is in the regions nearer the Rocky Mountains, but still occurs in sufficient quantity in some of the drier localities to be an important element in the native forage.

Poa compressa.

There are several varieties of this grass found in this region. Some have been introduced, while others seem to be indigenous. The form known as "Canadian blue-grass" seems to do best under cultivation. It is hardier than Kentucky blue-grass and will thrive on poorer soils, and hence is preferable for upland pastures. It seldom grows large enough to afford much hay, but as a pasture grass yields a large amount of very nutritious forage. It is an excellent grass for sheep pastures on account of its ability to endure close grazing and excessive trampling. A form of this species which is apparently indigenous grows almost as large as Kentucky Blue-grass and should be given a trial under cultivation.

Poa flava. (*See* Fowl Meadow-grass.)

Poa nemoralis. (*See* Wood Meadow-grass.)

Poa nevadensis.

Found in a "low, but dry, meadow near Grand Forks." Said to be quite abundant in this particular locality and to yield a large amount of excellent hay. It appears to be worthy of cultivation.

Poa pratensis. (*See* Kentucky Blue-grass.)

Porcupine-grass (*Stipa spartea*).

Abundant in dry prairies in the eastern part of both States. From the James River west it is largely replaced by Needle-grass (*Stipa comata*). The "spears" are very injurious to sheep and often do more or less injury to other stock. The plant produces an abundance of long root leaves which are valuable for forage. When closely pastured it can not develop seed, and hence is harmless, and the "spears" fall early, so that the hay may be obtained entirely free from them.

Prairie June-grass (*Kœleria cristata*).

This, one of the earliest native grasses, is abundant everywhere on dry prairies. Certain forms of it are also common in moist meadows in some localities. It is an excellent grass for early forage, and often forms a large part of the upland hay. It was much more plentiful the past season than it had been for a number of years, furnishing as much as 50 per cent of the forage in some places. Stockmen prize it very highly. It is called "Prairie Timothy" in some localities.

Red Clover (*Trifolium pratense*).

Cultivated in the older-settled portions, and often occurring as an escape in moist, protected ditches along railroads and waste places, where it seems to thrive quite well. It is being quite successfully grown in South Dakota in the Sioux Valley and in the Big Stone Basin. At Sioux Falls it has been grown with timothy for many years with very satisfactory results. "Various reports are given regarding its possible cultivation in North Dakota. The average opinion seems to be that it can not be successfully grown here. Personal observation teaches that it does well when sown in moist upland meadows which are somewhat protected, and that it does much better when mixed with timothy than when sown alone. It deserves to be cultivated more extensively" (Brannon).

Red-top (*Agrostis alba vulgaris*).

Cultivated more or less extensively in the moister portions of both States. Professor Brannon says "it yields a heavy crop in low, rather moist meadows, and does quite well on higher, dry ground." It does well in South Dakota in moist situations, and should be given a prominent place for mixtures to be sown on boggy lands or lake beds.

Reed Canary-grass (*Phalaris arundinacea*).

Common in low, moist meadows throughout the Northwest. In some localities it is being cultivated with good success. "It yields a large supply of excellent hay, which is greatly relished by all stock. The leaves remain green after fruiting, and the grass may be cut quite late and yet make very good hay. All observations and collections of this grass show that it is one of the most profitable lowland grasses in the State, and may be cultivated with confidence in moist or boggy soils" (Brannon).

Reed Fescue (*Scolochloa arundinacea*).

Rather a rare grass, growing in the shallow waters of sloughs and lake beds, occasionally occurring in sufficient quantity to form an important element in the lowland hay. It yields heavily, but is not very rich in the more important nutrient substances. It fruits abundantly, and might be used to advantage on very wet meadow lands.

Reed-grass (*Phragmites vulgaris*).

More or less abundant throughout in sloughs and margins of lakes and streams. It grows too large to be very valuable as a forage plant. While it is young it is often eaten by stock, and it is sometimes used for fodder, but its principal use is for thatching granaries and stock sheds. The "plumes" are much used for dry bouquets in winter decorations. On the sand bars along the Missouri River the rootstocks grow to an enormous length.

Reed Meadow-grass (*Glyceria aquatica*).

Common in shallow water, often furnishing a considerable part of the hay obtained from wet boggy meadows. The forage is relished by stock, but is not high in feeding value. The seeds are produced in abundance and form an important part of the food of wild fowl. It is a good grass for use in reclaiming old sloughs, bogs, and lake beds.

River Club-rush (*Scirpus fluviatilis*).

This rush is quite abundant in many places along fresh-water streams, lakes, and ponds and in sloughs. It is one of the most important of the rushes growing in this region, furnishing a large amount of forage which is relished by stock early in the season. It is an important element in "slough grass hay," and, though coarse, is readily eaten by stock and contains a high percentage of crude protein. It yields an abundance of seed, which makes an excellent food for poultry and has even been fed to cattle and horses with good results. It should be crushed or ground up when fed to stock, on account of the very hard seed coats. The large shallow lakes common in parts of the Dakotas are often almost entirely covered with this plant. Very frequently the lakes dry up in the latter part of the summer and many hundreds of tons of hay are cut from them.

Rush (*Scirpus* spp. and *Juncus* spp.).

For the more important kinds see Bog-rush, River Club-rush, and Meadow-rush.

Russian Thistle (*Salsola tragus*).

This vile weed has become quite generally distributed throughout the Northwest. When other forage is scarce stock will eat this plant quite readily either in the fresh state or when cured for hay, especially if, in the latter case, it is mixed with oat or millet hay. It has been fed to sheep with best results and many farmers in this region have wintered their flocks with little else in the shape of "roughness." But while many follow this practice if the "thistle" is already present on the farm, no one would recommend it to be sown for forage on account of its pernicious habits as a weed.

Rhynchospora capillacea. (*See* Slender Beak-rush.)

Salt-bushes (*Atriplex* spp.).

These plants occur in greater or less abundance in saline soils throughout the Northwest. One or two species have been introduced and several are indigenous. In many places in central and western Dakota these plants constitute a large part of the vegetation and furnish much of the native forage. All kinds of stock eat them with greater or less readiness and sheep are particularly fond of them. It is quite probable that some of the Australian salt-bushes could be introduced with profit into the regions where our native species flourish.

Salt-grass (*Distichlis spicata stricta*).

Abundant in saline soils throughout the Northwest. It is seldom eaten by stock unless there is a scarcity of better grasses. In the Bad Lands and elsewhere on the ranges, however, it is of considerable importance, as it thrives on soils that will produce but few other grasses. Sheep eat it more readily than other stock. It thrives along the irrigating ditches where they run through the "alkali" spots.

Sand-bur (*Cenchrus tribuloides*).

This grass occurs in great abundance in sandy soil in the Missouri Valley and, though stock eat it while young, it is regarded as a vile weed on account of the "burs" which are formed by the matured spikelets.

Sand Vetch (*Vicia villosa*).

This vetch is one of the hardiest legumes that has been cultivated for forage in the Northwest. It endures drought perfectly, grows rapidly, yields well, and is in condition to use at a time when the native forage is likely to be short on account of the dry weather of July and August. Its feeding value is very high and the forage in the fresh or dry state is greedily eaten by stock. At Brookings, Mellette, and elsewhere in South Dakota, as well as in North Dakota, it has given the best results. For summer soiling, for which it is most valuable, it may be sown in April or May, using a bushel to a bushel and a half of seed per acre with a like quantity of oats or other small grain. It should be fed in connection with plenty of prairie grass, grain straw, and like forage in order that all of the protein may be utilized. Green Corn, Cane, or Kaffir Corn can be fed with it to good advantage. The only obstacle in the way of the general cultivation of this vetch is the scarcity of seed and the difficulty in saving it in any large quantity, due to the habit of the plant of ripening seed in such small amounts at a time and continuing to bud and blossom until it freezes up in the fall.

Savastana odorata. (*See* Sweet-grass.)

Schedonnardus paniculatus. (*See* Wild Crab-grass.)

Scirpus atrovirens pallidus. (*See* Meadow-rush.)

Scirpus fluviatilis. (*See* River Club-rush.)

Scirpus lacustris. (*See* Great Bulrush.)

Scirpus robustus. (*See* Sea Club-rush.)

Scolochloa arundinacea. (*See* Reed Fescue.)

Sea Club-rush (*Scirpus robustus*).

More or less abundant in brackish water in both the Dakotas. What has been said regarding the uses of River Club-rush will apply equally well to this species.

Sedges (*Carex* spp.).

There is a great variety of sedges growing in this region. Though most of them are too rare to be of much economic importance, there are a few which add materially to the native forage in certain localities. Giant Sedge (*Carex aristata*) and Upright Sedge (*C. stricta*) afford a large amount of hay and pasturage on wet, boggy lands. Straw-colored Sedge (*Carex straminea*) and its relatives, with Silvery-topped Sedge (*Carex siccata*) and Brown-topped Sedge (*C. sartwellii*), add more or less to the forage of the drier meadows. On the dry uplands Dwarf Sedge (*Carex stenophylla*) and other small species, like *Carex pennsylvanica* and *C. communis*, form an important element in the pasturage, particularly early in the season before the true grasses have developed sufficiently for grazing.

Sheep's Fescue (*Festuca ovina*).

This is one of the most valuable of the Fescues for this region. Certain forms of this species are indigenous to the Black Hills region of South Dakota. Sheep's Fescue thrives on sandy soils and is an excellent plant for use in upland pastures, particularly those in which sheep are allowed to run. It is very hardy and grows well from seed. Red Fescue (*Festuca rubra*) has also been cultivated more or less in the Dakotas, and in some respects is even more desirable than Sheep's Fescue. It forms a better sod and is a stronger grower.

Short-leafed Eatonia (*Eatonia nitida*).

Found occasionally in the eastern part of North Dakota. The forage is of good quality, but the grass is too rare to be of much importance.

Sisyrinchium angustifolium. (*See* Blue-eyed grass.)

Slender Beak-rush (*Rhynchospora capillacea*).

Rare and too small to be of any importance as a forage plant.

Slender Cord-grass (*Spartina gracilis*).

Much like the common Cord-grass, but smaller and of less importance agriculturally. It occurs in moist saline soils, and, to a certain extent, replaces the larger species in the western part of the Dakotas.

Slender Fescue (*Festuca octoflora*).

A slender annual found on dry, rocky knolls. It adds more or less to the forage during the early part of the season, but it ripens its seeds and dries up so early that it is of little importance agriculturally. Its chief value lies in the fact that it thrives on soils upon which few other grasses will grow.

Slender Wheat-grass (*Agropyron tenerum*).

This is one of the best of the wheat-grasses. It is not so aggressive as some of the other species, as it does not spread by means of underground stems. It responds quickly to cultivation and gives heavy yields of first-class hay. It should receive more attention from farmers and stockraisers. (*See* fig. 1.)

Slough-grass (*Beckmannia erucæformis*).

Abundant in sloughs and wet places. While young it is much relished by stock, and often forms a considerable amount of the forage in low pastures and meadow lands. The hay, though readily eaten by stock, is not rich in crude protein, and hence is not so valuable as that of many other grasses in this region. In the artesian basin this grass is spreading rapidly along the streams formed by the waste water from the wells, and it seems possible that it may become an important grass in localities where better species can not be grown (fig. 8).

FIG. 8.—Slough-grass (*Beckmannia erucæformis*).

Small Panic-grass (*Panicum scribnerianum*).

Not uncommon in rather dry upland meadows, furnishing a small amount of nutritious forage.

Smooth Brome-grass (*Bromus inermis*).

An introduced species, which is rapidly becoming one of the most important forage plants of this region. Its hardiness, heavy yield of both forage and seed, and the ease with which a good stand can be obtained make it a very desirable grass for permanent meadows and pastures. It is not a good grass to use in short rotations, as the very characters which render it so hardy and so desirable for permanent fields enable it to persist in the soil, and hence it may become a weed under such conditions.

Sorghum (*Andropogon sorghum* vars.).

The saccharine sorghums are often cultivated for the manufacture of molasses and also for forage. For the latter purpose they are usually sown broadcast or in

drills and cut and fed green as a soiling plant or cured for hay. They are very greedily eaten by stock of all kinds, and nearly all who have tried growing them for forage are well pleased with the results obtained. The Early Amber varieties seem to be the favorites in this region, particularly the one known as Minnesota Early Amber.

Southern Poverty-grass (*Sporobolus vaginæflorus*).

This species is very common in eastern and southern South Dakota in dry soil along railroad grades, in waste places, and neglected fields. Though often eaten by stock, it affords but little forage and has practically no agricultural value.

Southern Spear-grass (*Eragrostis purshii*).

More or less common in dry soil, in waste places, and along railroad grades. Of little value agriculturally.

Spartina cynosuroides. (*See* Cord-grass.)

Spartina gracilis. (*See* Slender Cord-grass.)

Spiked Muhlenberg's-grass. (See *Muhlenbergia racemosa*.)

Spike-rush (*Eleocharis* spp.).

These little rushes often furnish a considerable amount of forage in wet, boggy meadows and pastures. They are relished by stock and compare favorably in feeding value with the grasses growing in similar places.

FIG. 9.—Squirrel-tail-grass (*Hordeum jubatum*).

Sporobolus airoides.

Common in saline soils in the Bad Land regions, where it affords more or less forage and is quite highly prized by stockmen.

Sporobolus asperifolius. (*See* Fine-topped Salt-grass.)

Sporobolus brevifolius.

A grass of little agricultural value, growing in rather dry soils. It is often called "prairie-grass" and "wire-grass."

Sporobolus cryptandrus.

More or less widely distributed throughout the Northwest in dry sandy soils. It is of little importance except perhaps in the Bad Lands, where it is often very abundant and is said to be "readily eaten by range cattle."

Sporobolus heterolepis. (*See* Wire-grass.)

Sporobolus longifolius. (*See* Long-leafed Prairie-grass.)

Sporobolus vaginæflorus. (*See* Southern Poverty-grass.)

Squirrel-tail (*Hordeum jubatum*).

This grass has become very abundant throughout nearly all parts of the Northwest. It furnishes a considerable amount of good pasturage early in the season, but later becomes a very bad pest. The rough "beards" work into the mouths of stock, especially horses, and cause ulcerated sores. Not unfrequently the animal becomes almost unable to eat, and unless promptly relieved may be permanently injured. The "beards" are also a source of annoyance to anyone walking through a field containing the pest, as they work into the clothing and can only be dislodged with difficulty (fig. 9).

Stink-grass (*Eragrostis major*).

A common grass of weedy habit. It yields considerable forage but stock avoid it, except when it is young or when cured as hay, on account of the strong odor given off by the inflorescence.

Stipa comata. (*See* Needle-grass.)

Stipa spartea. (*See* Porcupine-grass.)

Stipa viridula. (*See* Feather Bunch-grass.)

Swamp-chess (*Bromus ciliatus*).

Widely distributed in dry woodland pastures, but seldom occurring in sufficient quantity in any one locality to afford much forage.

Sweet-grass (*Sarastana odorata*).

This sweet-scented grass is quite generally distributed throughout the eastern part of both States. It possesses very little value as a forage crop, but the panicles are very much prized for filling sofa pillows and for winter bouquets. It sometimes becomes quite a pest in wheat fields, as it is difficult to eradicate on account of its strong rootstocks.

Switch-grass (*Panicum virgatum*).

Grows abundantly on moist meadows and to some extent on dry ground throughout the Northwest. It is a hardy grass and a strong grower, furnishing a large amount of pasturage, or, if allowed to stand until it blooms, yields a large crop of nutritious hay. It should be cut rather early to avoid the woody stems and loss of seed. When mature, the seed can be readily secured and the grass might be cultivated to advantage. In some localities it is known as "False Red-top." It thrives in the vicinity of the artesian waters and would doubtless improve rapidly under irrigation.

Tall Fescue (*Festuca elatior*).

Occasional in cultivation. It does well in low, rich meadows, but does not thrive on the upland soils and is less valuable for this region than Meadow Fescue.

Tall Grama (*Bouteloua racemosa*).

This grama is found throughout both States on the upland prairies. It is not so well liked by stock as "Blue Grama" and many other of the prairie grasses, hence it is not so valuable a pasture grass. It produces a fine growth of long root leaves which, when cut for hay, are readily eaten by stock, and it thrives better on light dry soils than most other species; consequently it is one of the most important hay grasses of the region.

Tall Oat-grass (*Arrhenatherum elatius*).

This is an excellent grass for meadows, and, though it does best on lowlands, gives fairly good returns on upland farms. It deserves a more general cultivation in the Dakotas and elsewhere in the Northwest. The forage is of excellent quality. The grass has given splendid results at Brookings and Mellette, S. Dak., and can be grown to the best advantage in mixtures with Red-Top, the Fescues, and like grasses.

Tickle-grass (*Agrostis scabra*).

Common everywhere, but of little value agriculturally.

Timothy (*Phleum pratense*).

Cultivated, and occurring as an escape. It is extensively grown throughout a large portion of South Dakota, which is becoming one of the most important "timothy-seed" growing States in the Union. "It is successfully grown in the moister portion of North Dakota. The first crop is reported to be the best and each succeeding one is lighter. The slight rainfall in many parts of the State hinders its cultivation in those regions. It yields a very good crop when mixed with a clover of some sort. It is improving with each succeeding season, which is due to the change in soil and climate, and indicates that it will become an important hay-producing plant in this State in the near future" (Brannon).

Trifolium beckwithii. (*See* Beckwith's Clover.)

Trifolium hybridum. (*See* Alsike.)

Trifolium pratense. (*See* Red Clover.)

Trifolium repens. (*See* White Clover.)

Tufted Hair-grass (*Deschampsia cæspitosa*).

"Grows in bunches in moist meadows and affords considerable hay, but unless it is cut early it is quite woody and lacking in nutrition" (Brannon).

Turkey-foot. (See *Andropogon hallii* and *A. provincialis.*)

Vicia americana. (*See* American Vetch.)

Vicia americana linearis. (*See* Narrow-leafed American Vetch.)

Vicia villosa. (*See* Sand Vetch.)

Vigna catjang. (*See* Cow Pea.)

Western Beard-grass (*Aristida fascicularis*).

More or less abundant in dry, sandy soils on prairies, waste places, and on gravelly knolls. While young it is eaten by stock, but the stems soon become so tough and wiry as to be unpalatable even in hay, and the grass is very difficult to cut with a mower. It has little value agriculturally.

Western Quack-grass (*Agropyron pseudorepens*).

Similar in distribution to Western Wheat-grass and, like that species, a valuable forage grass. (See also *Agropyron.*)

Western Wheat-grass (*Agropyron spicatum*). (See *Agropyron.*)

White Clover (*Trifolium repens*).

This is the most commonly grown clover in the Northwest. Though of no value for hay, it is an excellent pasture plant and thrives on a variety of soils. Its ability to withstand close grazing and excessive trampling makes it a good plant for sheep pastures. It is extensively grown on lawns and in dooryards.

White Sweet Clover (*Melilotus alba*).

Not infrequent in cultivation and occasionally as an escape. It is rather unpalatable as a forage, and stock will seldom eat it unless mixed with other fodder. It is an excellent honey plant, however, and is often grown for this purpose. It is perfectly hardy in the Northwest, and gives heavy yields under irrigation. "This plant was seen growing on irrigated ground on the southern slope of Turtle Mountains. It was 5 or 6 feet high and grew in a very dense mass. The owner had endeavored to clear the place of the plant, but had not been successful. It makes such an immense growth that it might be of considerable value for silage" (Brannon).

Wild Barley (*Hordeum nodosum*).

This grass seems to be rather rare in this region. It grows in moist, saline soils, but seldom occurs in sufficient quantity to be of much importance as a forage plant. Stock eat it readily, particularly before it "heads out."

Wild Crab-grass (*Schedonnardus paniculatus*).

An inconspicuous grass occurring in dry, sandy soils on prairies and in waste places. It is most abundant in central and western South Dakota, and is of practically no importance agriculturally.

Wild-oats (*Avena fatua*).

This grass has been introduced into grain fields and along railroads. Though it affords fairly good forage if cut while young, it is not so valuable for this purpose as common oats, and when once started in a field it is very difficult to get rid of. It is therefore to be regarded as a weed, and should be destroyed at once.

Wild-rye (*Elymus canadensis*).

Occurs in almost every section of the Northwest, and in some places yields a large crop of excellent hay. It is also valuable for early pasturage. It is frequently affected with ergot and should be cut before the fungus has developed.

Wild Timothy (*Muhlenbergia racemosa*).

More or less frequent in the eastern part of both States, generally on rather moist land. It yields well, but the forage is of only average quality. In some localities it is highly valued.

Wild Vetch (*Hosackia purshiana*).

This is probably the most valuable of the native vetches. It occurs throughout the Northwest in rather sandy soils. All kinds of stock eat it greedily, both in the green state and as hay, and stockmen regard it as one of the best forage plants

FIG. 10.—Wild Vetch (*Hosackia purshiana*).

FIG. 11.—Winter Fat (*Eurotia lanata*).

in the region. It has been much more abundant the past season than usual. It is more than likely that this plant will prove valuable for cultivation in sandy soils. In many localities along the Missouri River this vetch forms a considerable part of the native hay (fig. 10).

Wild Water Foxtail (*Alopecurus geniculatus* and var. *fulvus*).

More or less abundant in wet, boggy places. It affords a small amount of very good forage.

Winter Fat (*Eurotia lanata*).

A woolly, half-shrubby perennial found more or less abundantly in central and western Dakota. It thrives on "alkali" lands, and is much prized as a winter forage. It is claimed that animals eating this plant are less likely to be unhealthy, as it acts as a preventive of disease (fig. 11).

Wire-grass (*Sporobolus heterolepis*).

More or less abundant in dry meadows, on hillsides, and along swales. It is not relished by stock while in bloom on account of a strong, disagreeable odor which it gives off. At other times, however, and particularly when it is cured, stock eat it readily. The yield of forage is large because of the abundance of root-leaves produced. In the Sioux Valley it forms an important element in the native forage.

Wood Meadow-grass (*Poa nemoralis*).

Abundant in dry woodlands and broken prairies, often affording a great deal of forage.

Yellow Foxtail (*Chætochloa glauca*).

An introduced grass of weedy habit more or less common throughout the Northwest. Though a vile weed under most circumstances, like Green Foxtail, it may be used for forage to good advantage when it occurs in sufficient abundance and better forage is scarce. It is often called "Pigeon-grass" by farmers.

Yellow Sweet Clover (*Melilotus officinalis*).

This legume is perfectly hardy and gives an immense yield of forage. As with White Sweet Clover, stock will not eat it very well alone, because of a bitter substance which is present in considerable quantity. "This plant grows luxuriantly in the Turtle Mountains. It is not very valuable for forage, but may be cut with other forage plants while tender and the mixed hay will be readily eaten by stock. The abundant growth of the sweet clovers is in correspondence with other observations on the favorable adaptation of the soil and climate to the luxuriant growth of many valuable *leguminosæ*" (Brannon).

Zizania aquatica. (*See* Indian Rice.)

A CLASSIFIED LIST OF THE GRASSES AND FORAGE PLANTS COLLECTED OR OBSERVED IN THE DAKOTAS IN 1896.

GRAMINEÆ.

ANDROPOGONEÆ.

Andropogon hallii Hack.

North Dakota: Rugby Junction (Brannon 101).
South Dakota: Iron Springs in the Bad Lands (Williams).
Dry soil of sand hills.

Andropogon nutans L.

North Dakota: Grand Forks (Brannon 41), Oakes.
South Dakota: Aberdeen (Griffiths 103), Frankfort (Griffiths 52), Brookings, Plankinton (Wilcox 23), Chamberlain (Wallace 50).
Dry bottoms, rare except in the Sioux Valley.

Andropogon provincialis Lam.

North Dakota: Dickinson (Brannon 155), Minot, Bottineau, Devil's Lake, Jamestown, Grand Forks.
South Dakota: Brookings, Frankfort (Griffiths 59a, 59b), Aberdeen (Griffiths 135), Huron (Griffiths 20), Pierre (Griffiths 38), Blunt, Plankinton, Sioux Falls, White River (Wallace 15), Aurora County (Wilcox 51).
Moist prairies, chiefly east of the Missouri. Mr. Griffiths' number 59b has the leaves and sheaths more or less hairy, and has been called var. *villosus* by various writers.

Andropogon scoparius Michx.

North Dakota: Grand Forks (Brannon 26), Devil's Lake, Oakes, Jamestown, Bad Lands.

South Dakota: Aberdeen (Griffiths 138), Huron (Griffiths 19), Frankfort (Griffiths 51), Brookings, Plankinton, Pierre, Bad Lands, White River (Wallace 13, 14), Aurora County (Wilcox 50).

Dry prairies.

PANICEÆ.

Beckmannia erucæformis Host.

North Dakota: Grand Forks (Brannon 28), Larimore, Church's Ferry, Minot Bismarck.

South Dakota: Brookings (Wilcox 57), Plankinton (Wilcox 8), Iroquois, Artesian, City (Wilcox 59).

In wet ground along coulees and sloughs. It is becoming abundant along irrigating ditches and about reservoirs.

Panicum capillare L.

North Dakota: Medora (Brannon 134), Grand Forks, Oakes, Fargo.

South Dakota: Huron (Griffiths 7, 15), Aberdeen (Griffiths 120), Brookings. Cheyenne River (Wallace 2), White River (Wallace 46) a very depauperate form.

In dry soil of fields, in sandy basins, and on rolling prairies.

Panicum crus-galli L.

North Dakota: Church's Ferry (Brannon 56), Minot, Dickinson, Medora, Devil's Lake, Oakes, Jamestown, Grand Forks, Fargo.

South Dakota: Brookings, Frankfort (Griffiths 58a[2], 58b), Watertown, Redfield, Sioux Falls, Doland, Iroquois, Aurora County.

Moist ground in fields, etc., becoming very abundant along irrigating ditches and about reservoirs.

Panicum crus-galli muticum Vasey.

South Dakota: Aberdeen (Griffiths 108), Huron (Griffiths 14), Frankfort (Griffiths 58a, 58b[2]), Brookings, Sioux Falls, Iroquois.

Fields and waste places. Like the species, it is becoming plentiful along irrigating waters.

Panicum depauperatum Muhl.

South Dakota: Brookings (Wilcox 14), Aurora County, along Firesteel Creek.

Dry fields and prairies. The Brookings specimens are thickly covered with long hairs; the panicles are all borne on shortened stalks and the stem is much branched above.

Panicum miliaceum L.

South Dakota: Brookings, Aberdeen, Groton, Sioux Falls.

Cultivated, and often occurring as an escape.

Panicum proliferum Lam.

Jefferson, Greene County, Iowa (Wilcox 27).

Moist soil along roadsides, etc.

Panicum pubescens Lam.

South Dakota: Rosebud (Wallace 1).

Dry soil of uplands, rare.

Panicum scribnerianum Nash. (*Panicum scoparium* of the manuals).

North Dakota: Merrifield (Brannon 10), Oakes.

South Dakota: Rosebud (Wallace 28), Brookings, Aurora County.

Rather dry, open ground. It is common in the Sioux Valley, but it is apparently rare elsewhere.

Panicum scribnerianum leibergii Scribn.

South Dakota: Brookings (Wilcox 16).

Low, moist prairies and bottom lands, not yet found outside of the Sioux Valley. Distinguished from the species by its larger size, more conspicuously tuberculate-hairy leaves and sheaths, and contracted panicle. It has much of the aspect of *P. xanthophysum* Gray, but that species has smooth leaves and the lower empty glume is longer.

Panicum virgatum L.

North Dakota: Dunseith (Brannon 99), Minot, Church's Ferry, Minnewaukon, Dickinson, Grand Forks, Fargo, Oakes.

South Dakota: Frankfort (Griffiths 53), Huron (Griffiths 22), Aberdeen (Griffiths 82, 132), Brookings (Wilcox 15), Aurora County (Wilcox 54), along Firesteel Creek, Watertown, Sioux Falls, White River (Wallace 3, 4, 5). Generally on moist prairies and bottom lands, but occasionally found in drier soils. The last one of Mr. Wallace's specimens is a very much dwarfed form.

Panicum wilcoxianum Vasey.

South Dakota: Brookings.

Dry soil, rare. It probably occurs elsewhere in the State, being confused with *P. scribnerianum* and *P. depauperatum*, between which it is intermediate.

Chætochloa glauca (L.) Scribn. in Bull. 4, Div. Agros., p. 39 (1897).

South Dakota: Frankfort (Griffiths 54), Brookings, Sioux Falls, Iroquois, Aurora County.

Chætochloa italica (L.) Scribn. *l. c.*

Cultivated more or less extensively throughout the agricultural regions of both States, and often occurring as an escape in old fields and waste places.

Chætochloa italica germanica (Mill.) Scribn. (*Panicum germanicum* Mill.)

North Dakota: Webster's Chapel (Brannon 55), Church's Ferry, Langdon, Grand Forks, Fargo.

South Dakota: Brookings, Aberdeen, Watertown, Sioux Falls. Cultivated, and occasionally escaped.

Chætochloa viridis (L.) Scribn. *l. c.*

North Dakota: Devil's Lake (Brannon 50), Minot, Bottineau, Fargo, Grand Forks, Dickinson, Oakes.

South Dakota: Aberdeen (Griffiths 123), Brookings, Sioux Falls, Iroquois, Aurora County.

In dry soil of cultivated fields.

Cenchrus tribuloides L.

South Dakota: Pierre (Griffiths 30, 34), Chamberlain, Vermilion, Elk Point.

Sandy soil in fields and waste places.

ORYZEÆ.

Zizania aquatica L.

South Dakota: Huron (Griffiths 8), Tacoma Park (Griffiths 118), Brookings (Wilcox 33, 34), Sioux Falls.

Edges of streams and lakes.

Homalocenchrus oryzoides (L.) Poll.

South Dakota: Frankfort (Griffiths 49), Huron (Griffiths 10), Redfield (Griffiths 79), Brookings. Davison County (Wilcox 28), Bear Creek (Wallace 64).

Wet places along margins of streams.

Homalocenchrus virginicus (Willd.) Britton.

South Dakota: Brookings (Wilcox 70), Sioux Falls, Aurora County.
Low, wet places in woods and on banks of streams.

PHALARIDEÆ.

Phalaris arundinacea L.

North Dakota: Church's Ferry (Brannon 59), Grand Forks, Merrifield, Devil's Lake, Oakes.
South Dakota: Brookings (Wilcox 71), Aberdeen (Griffiths 127), Mellette (Griffiths 147), Aurora County (Wilcox 38), Antelope Creek (Wallace 42).
On low, wet ground or in shallow water; occasionally found in cultivation.

Savastana odorata (L.) Scribn.

North Dakota: Willow City (Brannon 80), Grand Forks (Brannon 4), Devil's Lake, Langdon, Minot, Church's Ferry.
South Dakota: Brookings (Wilcox 17), Iroquois, Oakwood Lakes.
Moist meadows and fields.

AGROSTIDEÆ.

Aristida basiramea Engl.

On the Waupsipinicon River, Iowa (Wilcox 30).
Dry soil.

Aristida fascicularis Torr.

South Dakota: Canning (Griffiths 43), Redfield (Griffiths 68), Aurora County (Wilcox 35), Rosebud (Wallace 34), White River (Wallace 33).

Aristida gracilis Elliott.

Waupsipinicon River, Iowa (Wilcox 31).
Dry banks, etc.

Stipa comata Trin. and Rupr.

North Dakota: Devil's Lake (Brannon 54), Merrifield (Brannon 23), Dickinson (Brannon 122), Grand Forks, Bottineau, Willow City, Church's Ferry, Oakes, Jamestown, Mandan.
South Dakota: Brookings (Wilcox 47), Aberdeen (Griffiths 86), Aurora County, Huron, Blunt, Indian Creek.
Dry, sterile soils, most abundant in the regions west of the James River.

Stipa spartea Trin.

North Dakota: Church's Ferry (Brannon 72), Grand Forks (Brannon 12), Devil's Lake, Bottineau, Minot, Dickinson, Fargo.
South Dakota: Brookings, Sioux Falls, Millbank, Aurora County.
Dry upland prairies, most abundant east of the James River.

Stipa viridula Trin.

North Dakota: Minot (Brannon 113), Dickinson, Oakes, Jamestown, Bismarck, Mandan.
South Dakota: Aberdeen (Griffiths 130), Huron, Blunt (Griffiths 107), Brookings (Wilcox 11), Aurora County (Wilcox 40), Rosebud (Wallace 35).
In dry soil of high prairies.

Sporobolus airoides Torr.

South Dakota: White River (Wallace 38), Indian Creek.
Dry, sterile soil of the Bad Lands region.

Sporobolus longifolius (Torr.) Wood.

North Dakota: Oakes.

South Dakota: Frankfort (Griffiths 48), Redfield (Griffiths 71), Brookings, Aurora County (Wilcox 21), Indian Creek (Wallace 32), Ree Heights (Griffiths 45).
Dry, rather sandy soil, in prairies and along railroad grades.

Sporobolus asperifolius Thurb.

South Dakota: Aurora County, Indian Creek, Iroquois (Wilcox 67).
Dry, sterile soil, abundant in the Bad Lands and on the ranges west of the Missouri.

Sporobolus brevifolius (Nutt.) Scribn. (*S. cuspidatus* of the manuals.)

North Dakota: Grand Forks (Brannon 48), Medora (Brannon 139), Minnewaukon (Brannon 65), Dickinson, Oakes.
South Dakota: Brookings (Wilcox 12), Redfield (Griffiths 70), Frankfort (Griffiths 60), Huron (Griffiths 12), White River (Wallace 37), Indian Creek (Wallace 36), Aurora County (Wilcox 52, 53).
Dry soil, throughout both the Dakotas.

Sporobolus cryptandrus (Torr.) Gray.

North Dakota: Medora (Brannon 125), Oakes.
South Dakota: Pierre (Griffiths 25, 32), Scatterwood (Griffiths 91, 104), Aurora County (Wilcox 6).
Dry, sandy soil.

Sporobolus heterolepis Gray.

North Dakota: Willow City (Brannon 77), Minot (Brannon 112), Dickinson (Brannon 132).
South Dakota: Brookings (Wilcox 10), Sioux Falls, Flandreau.
In dry soil along the borders of swales and on hillsides.

Sporobolus vaginæflorus (Torr.) Vasey.

South Dakota: Brookings, Sioux Falls, Aberdeen (Griffiths 94), Redfield (Griffiths 65), Pierre (Griffiths 36), Wessington (Griffiths 42), Huron, Iroquois, Aurora County (Wilcox 20).

Muhlenbergia racemosa (Michx.) B. S. P.

North Dakota: Girard Lake (Brannon 88), Oakes.
South Dakota: Brookings, Sioux Falls, Aberdeen (Griffiths 133), Redfield (Griffiths 77), Huron (Griffiths 21), Pierre (Griffiths 28, 35), Aurora County (Wilcox 26), White River (Wallace 30).
Dry bottom lands.

Muhlenbergia mexicana Trin.

South Dakota: Huron (Griffiths 6), Brookings, Sioux Falls, Aurora County (Wilcox 25).
Moist bottom lands. Griffiths' No. 6 is a form approaching the preceding species.

Muhlenbergia pungens Thurb.

South Dakota: Rosebud (Wallace 61).
Sandy soil of "blow outs," etc.

Eriocoma cuspidata Nutt.

North Dakota: Rugby Junction (Brannon 96), Dickinson.
South Dakota: Bad Lands along the Cheyenne River (Wallace 39).
In sterile, sandy soil, growing in dense bunches.

Oryzopsis micrantha Thurb.

South Dakota: Top of Sheep Mountain, near Cheyenne River (Wallace 40).
Sterile, sandy soil.

Phleum pratense L.

North Dakota: Grand Forks (Brannon 18), Iola, Church's Ferry, Hillsboro, Fargo, Oakes.

South Dakota: Millbank, Watertown, Brookings, Sioux Falls, Mellette (Griffiths 144), Plankinton.
Cultivated lands.

Alopecurus geniculatus L.

South Dakota: Head of White Willow Creek (Wallace 56).
Wet soil.

Alopecurus geniculatus fulvus (Smith) Scribn.

North Dakota: Grand Forks (Brannon 30), Devil's Lake, Fargo.
South Dakota: Brookings, Sioux Falls, Salem, Aurora County (Wilcox 55, 69), Rosebud (Wallace 28).
Wet, boggy meadows, and in shallow water.

Agrostis alba L.

North Dakota: Red River Valley.
South Dakota: Brookings, Frankfort (Griffiths 56), Redfield (Griffiths 78), Sioux Falls.

Agrostis scabra Willd.

North Dakota: Bottineau (Brannon 82), Langdon, Grand Forks, Dunseith (Brannon 98), Rugby Junction, Minot (Brannon 111), Medora, Fargo, Dickinson, Willow City (Brannon 81).
South Dakota: Brookings (Wilcox 64), Sioux Falls, Salem, Huron, Aurora County, head of White Willow Creek (Wallace 41).
In dry or moist soil everywhere.

Calamagrostis americana (Scribn.) Scribn. Bull. 5, Div. Agros., p. 27 (1897). (*C. robusta* Vasey, not Phillipi.)

North Dakota: Willow City (Brannon 76), Church's Ferry, Grand Forks, Oakes, Fargo.
South Dakota: Brookings (Wilcox 48, 49, 61, 62), Plankinton (Wilcox), Huron, Aberdeen (Griffiths 95), Rosebud (Wallace 31).
In moist soil of lowlands.
Mr. Wilcox's No. 61 is a form with the inflorescence much more contracted than usual.

Calamagrostis canadensis Beauv.

North Dakota: Church's Ferry (Brannon 61, 63), Minot, Devil's Lake, Oakes, Fargo.
South Dakota: Brookings, Sioux Falls, Arlington, Aberdeen, Huron, Plankinton.
In moist soil, becoming quite abundant along irrigating ditches and about reservoirs.

Calamagrostis scribneri Beal. (*Calamagrostis dubia* Scribn.).

North Dakota: Bottineau (Brannon 91), Edinburg.
Moist soil of low prairies.

Calamagrostis montanensis Scribn.

North Dakota: Medora (Brannon 130).
South Dakota: Brookings, Rondell (Griffiths 129), Aurora County (Wilcox 44).
Dry hills and prairies.

Calamovilfa longifolia (Hook.) Scribn.

North Dakota: Dickinson (Brannon 118), Medora, Mandan, Bottineau, Church's Ferry, Minnewaukon, Minot, Oakes, Fargo.
South Dakota: Brookings (Wilcox 13), Sioux Falls, Salem, Iroquois, Huron, Watertown, Aberdeen (Griffiths 113, 136), Pierre (Griffiths 29), Aurora County (Wilcox 56), White River (Wallace 49).
Sandy soil.

AVENEÆ.

Deschampsia cæspitosa Beauv.

North Dakota: Inkster (Brannon 34).
In moist soil of low meadows.

Avena fatua L.

North Dakota: Grand Forks (Brannon 49), Dickinson (Brannon 115).
South Dakota: Castlewood (Griffiths 141), Elkton, Deuel County.
In dry cultivated fields and along railroad grades.

Avena americana Scribn.

North Dakota: Langdon (Brannon 38).
In dry soil on high prairies. Culms in bunches.

Avena sativa L.

North Dakota: Inkster (Brannon 40).
Adventitious along roadsides. Extensively cultivated throughout both the Dakotas.

Arrhenatherum elatius (L.) Beauv.

South Dakota: Brookings, Mellette (Griffiths 142).
Cultivated, and occasionally as an escape.

CHLORIDEÆ.

Schedonnardus paniculatus (Nutt.) Trelease.

South Dakota: Aberdeen (Griffiths 121), Pierre (Griffiths 31), Aurora County (Wilcox), Cheyenne River at the mouth of Battle Creek (Wallace 43).
Dry sterile soil.

Spartina cynosuroides Willd.

North Dakota: Dickinson (Brannon 119), Red River Valley, Oakes, Mandan.
South Dakota: Brookings, Sioux Falls, Aberdeen (Griffiths 96, 116), Huron (Griffiths 3), Firesteel Creek (Wilcox).
More or less abundant in sloughs and along irrigating ditches.

Spartina gracilis Trin.

North Dakota: Minnewaukon (Brannon 64), Bad Lands west of the Missouri.
South Dakota: Aberdeen (Griffiths 125), Clark County (Carter), Cheyenne River at the mouth of Indian Creek (Williams and Wilcox, August, 1891).
In moist, alkaline soils.

Bouteloua racemosa Lag.

North Dakota: Minot (Brannon 107), Merrifield, Dickinson, Jamestown, Oakes.
South Dakota: Brookings (Wilcox 3, 4), Redfield (Griffiths 67), Aberdeen (Griffiths 83, 134), Frankfort (Griffiths 61), Huron (Griffiths 18), Firesteel Creek (Wilcox), Medicine Horse Creek (Wallace 10), Indian Creek (Wallace 9).
Dry prairies and hillsides.

Bouteloua hirsuta Lag.

South Dakota: Brookings, Sioux Falls, Iroquois, Aurora County (Wilcox 41).
Dry soil of rocky knolls.

Bouteloua oligostachya Torr.

North Dakota: Minot (Brannon 104), Dickinson (Brannon 133), Devil's Lake, Church's Ferry, Bottineau, Jamestown, Grand Forks, Oakes, Bismarck.
South Dakota: Brookings (Wilcox 1, 2), Aberdeen (Griffiths 137), Pierre (Griffiths 26), Huron, Sioux Falls, Salem, White River (Wallace 20, 47), Aurora County (Wilcox).

Bulbilis dactyloides (Nutt.) Rafin.

North Dakota: More or less abundant along the Northern Pacific Railroad west of Jamestown.

South Dakota: Aberdeen (Griffiths 122), Redfield (Griffiths 66), Huron (Griffiths 11), Highmore (Griffiths 46), Firesteel Creek (Wilcox), Medicine Root Creek (Wallace 11), White River (Wallace 48), Aurora County (Wilcox 43), Iroquois (Wilcox 42).

Dry prairies.

FESTUCACEÆ.

Munroa squarrosa Torr.

South Dakota: Pierre (Griffiths 24), Little White River (Wallace 8), Cheyenne River (Wallace 7).

Dry, sandy soil.

Phragmites vulgaris Trin.

North Dakota: Church's Ferry (Brannon 60), Minnewaukon, Minot, Sweet Briar.

South Dakota: Brookings, Redfield (Griffiths 73), Canning (Griffiths 105), Aurora County (Wilcox).

Wet, sandy soil, along margins of streams and lakes.

Leptochloa fascicularis Gray.

South Dakota: Brookings, Aberdeen (Griffiths 111), Aurora County, along Firesteel Creek (Wilcox 7).

Margins of brackish pools.

Eragrostis major Host.

South Dakota: Brookings, Aberdeen (Griffiths 117), Pierre (Griffiths 23, 37), Sioux Falls, White River (Wallace 22).

Fields and waste places.

Eragrostis pectinacea spectabilis (Pursh) Gray.

Iowa: Waupsipinicon River (Wilcox 29).

Eragrostis purshii Schrad.

South Dakota: Brookings, Huron, Plankinton (Wilcox 9).

Fields and waste places.

Eragrostis reptans Nees.

South Dakota: Brookings, Aurora County (Wilcox 46), Aberdeen (Griffiths 140), Huron.

Banks of streams and dried-up ponds. The Aurora County specimens are more or less pubescent and have the spikelets in capitate cluster. They apparently belong to the var. *capitata* of Nuttall.

Eatonia nitida (Sprengl.) Nash. (*E. dudleyi* Vasey).

North Dakota: Grand Forks (Brannon 11).

Eatonia obtusata Gray.

North Dakota: Dunseith (Brannon 95).

South Dakota: Brookings (Wilcox 60), Aurora County (Wilcox), Rosebud (Wallace 25), White River (Wallace 58), Indian Creek (Wallace 59), Sioux Falls.

Rather dry bottom lands.

Eatonia pennsylvanica Gray.

North Dakota: Pleasant Lake (Brannon 75).

South Dakota: Brookings, Sioux Falls.

Open woods.

Koeleria cristata Pers.

North Dakota: Grand Forks (Brannon 14), Devil's Lake, Langdon, Bottineau, Church's Ferry, Minot, Dickinson, Oakes, Jamestown, Fargo.

South Dakota: Brookings (Wilcox 37), Plana (Griffiths 131), Huron (Griffiths 1), buttes along the Keya Paha (Wallace 26), Rosebud (Wallace 27), White Clay buttes (Wallace 60), Sioux Falls, Salem, Iroquois, Aurora County (Wilcox 39).
Dry prairies.

Catabrosa aquatica Beauv.

South Dakota: White River (Wallace 23).
Wet, marshy ground.

Melica hallii Vasey.

North Dakota: Langdon (Brannon 45), Dunseith (Brannon 100).
In dry soil of high, rolling prairies.

Distichlis spicata stricta Thurb.

North Dakota: Church's Ferry (Brannon 62), Grand Forks, Bad Lands west of the Missouri River.
South Dakota: Brookings, Rondell (Griffiths 128), Aberdeen (Griffiths 112), Iroquois, Huron, Aurora County (Wilcox 36), White River (Wallace 6), Bad Lands along Cheyenne River (Wallace 57).
Saline soil.

Dactylis glomerata Linn.

North Dakota: Red River Valley.
South Dakota: Brookings, Sioux Falls.
Cultivated, and occasionally escaped.

Poa arida Vasey.

North Dakota: Merrifield (Brannon 19), Oakes.
South Dakota: Brookings, Aurora County (Wilcox 32), Huron, Iroquois.
Moist ground.

Poa buckleyana Nash.

North Dakota: Merrifield (Brannon 24), Dickinson (Brannon 120), Devil's Lake, Church's Ferry.
South Dakota: Bad Lands along White River (Wallace).
In dry soil of prairies and tops of buttes, forming dense bunches.

Poa compressa Linn.

South Dakota: Brookings, Highmore (Griffiths 47), James River Valley, Iroquois, Chamberlain, Brown County.
Dry soil, cultivated, and some forms apparently indigenous.

Poa nemoralis Linn.

North Dakota: Langdon (Brannon 39), Conway (Brannon 33), Dickinson (Brannon 126).
South Dakota: Big Stone, Lake Hendricks, Brookings, Sioux Falls, Canning, Battle Creek (Wallace 19), Sand Lake.
In dry soil. Nos. 33 and 126 of Professor Brannon's collection belong to the form known as *Poa cæsia strictior* Gray.

Poa nevadensis Vasey.

North Dakota: Grand Forks (Brannon 16).
In low but rather dry meadows.

Poa pratensis Linn.

North Dakota: Grand Forks (Brannon 2, 17, 42), Langdon (Brannon 43), Inkster, Oakes, Fargo, Church's Ferry.
South Dakota: Big Stone, Brookings, Sioux Falls, Aurora County, Huron, Aberdeen.
Cultivated, and also occurring wild in moist prairie meadows.

Poa flava L. (*Poa serotina* Ehrh.)

North Dakota: Grand Forks (Brannon 13), Inkster (Brannon 32), Minnewaukon (Brannon 67), Church's Ferry (Brannon 73), Willow City (Brannon 83).
South Dakota: Brookings, Sioux Falls, Blunt, Lake Hendricks, Aberdeen (Griffiths 114).
In both dry and moist soils. The specimens from Minnewaukon grew in a dry alkaline meadow.

Glyceria airoides (Nutt.) Gray.

North Dakota: Minnewaukon (Brannon 71), Medora (Brannon 136), Grand Forks, Inkster, Mandan.
South Dakota: throughout the Bad Lands region.
In moist, alkaline soils.

Glyceria aquatica J. E. Smith.

North Dakota: Monroe (Brannon 110), Grand Forks.
South Dakota: Brookings, Aurora County, Frankfort (Griffiths 50), Medicine Horse Creek (Wallace 29).
Shallow water.

Glyceria fluitans R. Br.

South Dakota: Brookings (Wilcox 66), and elsewhere in the Sioux Valley.
In shallow water.

Glyceria nervata Trin.

South Dakota: Brookings (Wilcox 18), Sioux Falls, Aurora County, White River (Wallace 62), Bear Creek (Wallace 21).
In wet, boggy meadows or shallow water.

Scolochloa arundinacea (Lilj.) MacM.

North Dakota: Webster's Chapel (Brannon 57).
South Dakota: Brookings.
Shallow water, apparently quite local in distribution.

Festuca elatior Linn.

South Dakota: Brookings, Mellette (Griffiths 145).
Cultivated, and escaping here and there along roadsides.

Festuca elatior pratensis Gray.

South Dakota: Brookings, Mellette (Griffiths 146).
Cultivated, and occasionally escaping.

Festuca octoflora Walt.

North Dakota: A few specimens mixed with a miscellaneous lot of material collected at Langdon and Inkster.
South Dakota: Brookings, Sioux Falls, Aurora County (Wilcox 65).
Dry soil on rocky hills.

Bromus ciliatus Linn.

North Dakota: Bottineau (Brannon 84, 92), Grand Forks, Girard Lake.
South Dakota: Big Stone, Brookings, Sioux Falls, Iroquois, Aurora County, Redfield (Griffiths 74).
In dry soil of open woods.

Bromus inermis Leyss.

South Dakota: Brookings, Mellette (Griffiths 143), Aurora County (Wilcox), Beadle County.
Cultivated, and spreading into roadsides and fields.

Bromus kalmii Gray.

North Dakota: Bottineau (Brannon 79, 87).
In open woods.

HORDEÆ.

Agropyron caninum R. & S.

South Dakota: Brookings (Wilcox 22), Iroquois, Huron.
Dry fields and roadsides.

Agropyron divergens Nees.

North Dakota: Dickinson (Brannon 123).
South Dakota: Bad Lands along Indian Creek (Williams and Wilcox, August, 1891).
Dry hillsides and tops of buttes.

Agropyron pseudorepens Scribn. & Smith. Bull. 4, Div. Agros., p. 34 (1897).
North Dakota: Medora (Brannon 127), Grand Forks, Inkster, Oakes.
South Dakota: Brookings, Frankfort (Griffiths 55), Huron, Pierre (Griffiths 106), Cheyenne River (Wallace 55).
In rich but rather dry soil.

Agropyron richardsoni Schrad. (*A. unilaterale* Cass.)

North Dakota: Dickinson (Brannon 131), Willow City, Oakes.
South Dakota: Brookings (Wilcox 72), Le Beau, Chamberlain.
Dry prairie soil.

Agropyron spicatum (Pursh) Scribn. & Smith, Bull. 4, Div. Agros., p. 33. (*Agropyrum repens* var. *glaucum* of the manuals.)

North Dakota: Willow City (Brannon 78), Church's Ferry, Inkster, Edinburg, Devil's Lake, Oakes, Fargo.
South Dakota: Brookings, Huron (Griffiths 17), Aberdeen (Griffiths 81), St. Lawrence (Griffiths 41), Sioux Falls, Salem, Aurora County (Wilcox 19), White River (Wallace 44, 51, 52).
In dry soil of prairies, roadsides, and neglected fields.

Agropyron tenerum Vasey.

North Dakota: Dickinson (Brannon 128), Church's Ferry, Oakes.
South Dakota: Brookings (Wilcox 45), Huron (Griffiths 5, 16), Frankfort (Griffiths 62), Redfield (Griffiths 69), Aurora County, Canning, White River (Wallace 53), Chamberlain, Bangor, Indian Creek.
Dry bottom lands, along roadsides, and in neglected fields.

Hordeum jubatum L.

North Dakota: Dickinson (Brannon 117), Oakes, Fargo, Jamestown, Mandan.
South Dakota: Brookings, Sioux Falls, Salem, Aurora County (Wilcox), Huron (Griffiths 13), Aberdeen (Griffiths 85), White River (Wallace 54).
Waste places in fields, along irrigating ditches, and in meadows. Abundant throughout the Northwest.

Hordeum nodosum L.

South Dakota: Sioux Falls.
Margins of desiccated ponds, particularly where the soil is somewhat alkaline.

Elymus canadensis L.

North Dakota: Minnewaukon (Brannon 66), Devil's Lake, Minot, Grand Forks, Dickinson, Oakes, Fargo.
South Dakota: Brookings (Wilcox 63), Sioux Falls, Redfield (Griffiths 75), Frankfort (Griffiths 64), Pierre (Griffiths 27, 33), Aurora County (Wilcox 24), White River (Wallace 16), Indian Creek (Wallace 17).
In rather dry soil of open woods, meadows, and neglected tree claims.

Elymus macounii Vasey.

North Dakota: Minot (Brannon 106), Grand Forks.
South Dakota: Brookings, Big Stone, Frankfort (Griffiths 63), Huron (Griffiths 4).
Dry bottom lands and neglected tree claims.

Elymus robustus Scribn. & Smith, Bull. 4, Div. Agros., p. 37 (1897).

South Dakota: Mellette (Griffiths 139).

Elymus striatus Willd.

South Dakota: Brookings (Wilcox 68).
Open woodlands.

Elymus virginicus L.

North Dakota: Minot (Brannon 114), Bottineau, Oakes.
South Dakota: Brookings (Wilcox 5), Sioux Falls, Redfield (Griffiths 76), Aurora County, White River (Wallace 45), Indian Creek (Wallace 18).

Elymus sp.

North Dakota: Bottineau (Brannon 85).
Dry soil along the edges of thickets. "The heads bend downward shortly after the flowering season" (Brannon).

TYPHACEÆ.

Typha latifolia L.

South Dakota: Aberdeen (Griffiths 126).
Becoming very abundant in the water from the artesian wells.

CYPERACEÆ.

Cyperus acuminatus Torr. & Hook.

South Dakota: Frankfort (Griffiths 57).
Dry ditches.

Cyperus erythrorhizos Muhl.

South Dakota: Brookings, Sioux Falls, Iroquois, Tacoma Park on the James River (Griffiths 97).

Cyperus schweinitzii Torr.

North Dakota: Rugby Junction (Brannon 97).
South Dakota: Rock Ridge Creek (Wallace 74), Rosebud (Wallace 75), Medicine Root Creek (Wallace 76).
In dry sandy soil.

Cyperus speciosus Vahl.

South Dakota: Huron (Griffiths 9).
Moist, shady places.

Eleocharis acicularis R. & S.

North Dakota: Pleasant Lake (Brannon 74).
South Dakota: Brookings, Dell Rapids, Brady Creek (Wallace 73).
Growing in dense mats along the banks of ponds or streams.

Eleocharis acuminata (Muhl.) Nees.

North Dakota: Conway (Brannon 35).
South Dakota: Brookings.
Wet, boggy soil.

Eleocharis palustris L.

North Dakota: Girard Lake (Brannon 103).
South Dakota: Brookings, Sioux Falls, Big Stone.
In low, wet ground or shallow water.

Scirpus americanus Pers. (*S. pungens* Vahl.)

South Dakota: Brookings, Redfield (Griffiths 80), Aberdeen (Griffiths 115a, b, c), Rosebud (Wallace 71).

Moist soil and margins of lakes, ponds, and along irrigating ditches. Mr. Griffiths' specimens from Aberdeen show the variation of the species under different conditions of soil moisture. No. 115c, which grew in the water of an irrigating ditch, seems to be variety *longispicatus* Britt., but the plants are immature.

Scirpus atrovirens Muhl.

South Dakota: Brookings, Sioux Falls, Iroquois, Rock Ridge Creek (Wallace 69).

Wet, boggy land.

Scirpus atrovirens pallidus Britt.

North Dakota: Grand Forks (Brannon 31).

South Dakota: Bear Creek (Wallace 72).

Wet, boggy land.

Scirpus fluviatilis Gray.

North Dakota: Grand Forks (Brannon 25).

South Dakota: Brookings, Sioux Falls, Aurora County (Wilcox), Aberdeen (Griffiths 119), Redfield (Griffiths 72), Huron (Griffiths 2).

Shallow water. Very common along the borders of lakes throughout the Northwest and spreading very rapidly along irrigating ditches and about reservoirs.

Scirpus lacustris L.

North Dakota: Grand Forks (Brannon 15), Dunseith (Brannon 94), Devil's Lake, Fargo, Oakes, Jamestown.

South Dakota: Big Stone, Lake Hendricks, Brookings, Sioux Falls, Running Water, Blunt, Aberdeen (Griffiths 102, 110), Aurora County (Wilcox), Rosebud (Wallace, 70).

In shallow water of sloughs and along lake shores.

Scirpus robustus Pursh.

North Dakota: Minnewaukon (Brannon 69), Grand Forks.

South Dakota: Brookings, Iroquois, Aberdeen (Griffiths 109), Miller (Griffiths 44), Aurora County (Wilcox).

In brackish water of shallow lakes and along irrigating ditches.

Rhynchospora capillacea Torr.

North Dakota: Bottineau (Brannon 89).

In dense mats on boggy ground.

Carex aristata R. Br.

North Dakota: Girard Lake (Brannon 102a).

South Dakota: Brookings, Tacoma Park (Griffiths 99), Plana (Griffiths 84), Aberdeen (Griffiths 93).

Wet, boggy land.

Carex assinniboiensis W. Boott (?).

South Dakota: Oakwood Lakes (Griffiths 88).

Woodlands.

Carex festucacea Willd.

North Dakota: Minot (Brannon 116a), Oakes.

South Dakota: Brookings.

Sloughs.

Carex filifolia Nutt.

South Dakota: Top of Sheep Mountain in the Bad Lands near Cheyenne River (Wallace 75).

Carex flava L.

North Dakota: Bottineau (Brannon 90).
In boggy ground.

Carex haydeni Dewey.

South Dakota: Tacoma Park (Griffiths 99b).
Sloughs.

Carex lanuginosa Michx.

North Dakota: Girard Lake (Brannon 102b), Oakes.
South Dakota: Brookings, Iroquois, Aurora County.
Moist, boggy land.

Carex laxiflora blanda (Dewey) Boott.

South Dakota: Oakwood Lakes (Griffiths 87).
Open woods.

Carex meadii Dewey.

North Dakota: Langdon (Brannon 37), Oakes.
South Dakota: Brookings.
Moist soil.

Carex pennsylvanica Lam. (?).

North Dakota: Grand Forks (Brannon 29).
Dry soil. Specimens immature.

Carex retrorsa Schwein.

South Dakota: Brookings, Flandreau, Aurora County.
Wet, boggy meadows.

Carex sartwellii Dewey.

North Dakota: Grand Forks (Brannon 8, 27, 70).
In sloughs and moist meadows. Nos. 8 and 27 are staminate and immature.

Carex siccata Dewey.

South Dakota: Brookings, Aurora County (Wilcox).
Rather dry meadows.

Carex stipata Muhl.

South Dakota: Rosebud (Wallace 75).

Carex stricta Lam.

North Dakota: Grand Forks (Brannon 9), Oakes.
South Dakota: Brookings, Sioux Falls, Aurora County (Wilcox).
Wet, boggy meadows.

Carex stricta angustata Bailey.

North Dakota: Girard Lake (Brannon 102c).
South Dakota: Brookings.
Low, damp ground.

Carex tenera Dewey.

North Dakota: Minot (Brannon 116b).
South Dakota: Brookings.
Sloughs.

Carex vulpinoidea Michx.

South Dakota: Brookings, Chamberlain, White River (Wallace 74).
Meadows.

Carex xerantica Bailey.

North Dakota: Devil's Lake (Brannon 52).
South Dakota: Tacoma Park (Griffiths 98).
Rather dry soil.

JUNCACEÆ.

Juncus balticus Willd.

North Dakota: Dunseith (Brannon 93), Knox, Grand Forks.
South Dakota: Brookings.
In wet bottom lands.

Juncus bufonius L.

South Dakota: White River (Wallace 65).
Wet, boggy places.

Juncus nodosus L.

North Dakota: Dickinson (Brannon 121).
South Dakota: Brookings, Iroquois, Sioux Falls.
Low ground.

Juncus tenuis Willd.

North Dakota: Minot (Brannon 109).
South Dakota: Brookings, head of White Willow Creek (Wallace 67), Rosebud (Wallace 68).
In low, moist ground.

Juncus torreyi Coville.

North Dakota: Minnewaukon (Brannon 68), Devil's Lake (Brannon 51).
South Dakota: Brookings, Iroquois, Medicine Root Creek (Wallace 66).
Wet meadows.

IRIDACEÆ.

Sisyrinchium angustifolium Mill.

North Dakota: Grand Forks (Brannon 3), Langdon, Devil's Lake.
South Dakota: Brookings, Aurora County (Wilcox), Aberdeen (Griffiths 101), Sioux Falls.

POLYGONACEÆ.

Polygonum aviculare L.

North Dakota: Oakes, Fargo, Jamestown.
South Dakota: Brookings, Sioux Falls, Huron, Aberdeen, Aurora County (Wilcox).
Dry soil in waste places and roadsides. Common everywhere in the Northwest.

Polygonum erectum L.

South Dakota: Brookings, Sioux Falls, Aurora County (Wilcox).
Fields and waste places.

Polygonum littorale Link.

South Dakota: Brookings.
Old fields and roadsides.

CHENOPODIACEÆ.

Chenopodium album L.

North Dakota: Oakes, Jamestown, Fargo.
South Dakota: Brookings, Huron, Iroquois, Sioux Falls, Aberdeen, Aurora County (Wilcox).
Fields and waste places. Abundant throughout.

Chenopodium leptophyllum (Moq.) Nutt.

South Dakota: Brookings, Huron, Iroquois, Aurora County (Wilcox 73).

Atriplex argenteum Nutt.

South Dakota: Pierre, Aurora County (Wilcox), White River.
In "gumbo" soil.

Atriplex hastatum L.

South Dakota: Brookings, Sioux Falls, Iroquois, Aberdeen, Aurora County (Wilcox).
Waste places in saline soils, "gumbo flats," etc.

Eurotia lanata Moq.

Dry "alkali" soil in central and western South Dakota.

Salsola tragus L.

More or less abundant in both the Dakotas.

LEGUMINOSÆ.

Medicago sativa L.

Frequently seen in cultivation in both States.

Melilotus alba Lam.

North Dakota: Southern slope of the Turtle Mountains (Brannon).
South Dakota: Brookings, Mellette (Griffiths 155), Sioux Falls, Brown County.
Cultivated, and also escaped to roadsides, railroad embankments, and waste places.

Melilotus officinalis Willd.

North Dakota: Turtle Mountains (Brannon), Fargo.
South Dakota: Brookings, Sioux Falls.
Cultivated, and occasionally escaped to waste places, etc.

Lupinus luteus L.

South Dakota: Brookings, Mellette (Griffiths 149).
Cultivated; thriving in sandy soil.

Trifolium beckwithii Brewer.

South Dakota: Brookings.
Moist meadows.

Trifolium hybridum L.

North Dakota: Grand Forks (Brannon 21), Church's Ferry, Hillsboro, Fargo.
South Dakota: Brookings, Aberdeen, Mellette (Griffiths 150), Sioux Falls, Aurora County.
Cultivated, and escaped to roadsides and meadows.

Trifolium pratense L.

North Dakota: Church's Ferry (Brannon 58), Grand Forks, Devil's Lake, Fargo, Jamestown.
South Dakota: Brookings, Millbank, Sioux Falls, Watertown, Aberdeen, Mellette (Griffiths 151, 152), Plankinton (Wilcox), Huron, Miner County.
Cultivated, and escaped to moist meadows, roadsides, and ditches.

Trifolium repens L.

North Dakota: Oakes, Fargo, Jamestown.
South Dakota: Brookings, Millbank, Sioux Falls, Salem, Huron, Aberdeen, Aurora County, Watertown, Miner County.
Cultivated in pastures and dooryards, and escaped to roadsides and waste places.

Hosackia purshiana Benth.

North Dakota: Medora (Brannon 124), Dickinson, Minot, Fort Totten, Langdon, Grand Forks, Oakes, Jamestown, Mandan.
South Dakota: Brookings, Aberdeen (Griffiths 92), Pierre, Chamberlain, Huron, Aurora County (Wilcox), Redfield.

Sandy soil, abundant in the valleys of the James and Missouri rivers, and more or less common throughout both States.

Psoralea argophylla Pursh.

Prairies throughout the Northwest.

Psoralea esculenta Pursh.

Sandy or gravelly soil throughout.

Dalea alopecuroides Willd.

South Dakota: Aurora County (Wilcox).
Sandy soil. Abundant in the lower Missouri Valley.

Astragalus adsurgens Pall.

North Dakota: Bottineau (Brannon 86), Oakes.
South Dakota: Brookings, Aberdeen, Huron, Salem, Iroquois, Aurora County (Wilcox 83).
In dry soil on high prairies.

Astragalus bisulcatus Gray.

North Dakota: Manvel (Brannon 1), Grand Forks.
South Dakota: Bad Lands between the White and Cheyenne rivers.

Astragalus canadensis L.

South Dakota: Brookings (Wilcox 81), Iroquois, Sioux Falls, Aurora County (Wilcox).

Astragalus caryocarpus Ker.

North Dakota: Minot (Brannon 105), Dickinson, Grand Forks, Oakes.
South Dakota: Brookings (Wilcox 79), Watertown, Sioux Falls, Aberdeen, Huron, Aurora County (Wilcox).
Dry soil on rolling prairies.

Astragalus flexuosus Dougl.

North Dakota: Grand Forks (Brannon 6), Devil's Lake.
South Dakota: Brookings, Aurora County (Wilcox), McPherson County, Iroquois, Lake Hendricks (Wilcox 80).
Dry prairies.

Astragalus hypoglottis L.

North Dakota: Grand Forks (Brannon 7), Inkster, Oakes, Jamestown.
South Dakota: Brookings (Wilcox 82), Salem, Huron, Watertown, Aberdeen, Aurora County (Wilcox).
Dry prairies and banks of coulees.

Astragalus missouriensis Nutt.

South Dakota: Aurora County (Wilcox 77).
Prairies.

Astragalus plattensis Nutt.

South Dakota: Aurora County (Wilcox), Salem (Wilcox 78).
Sandy soil.

Oxytropis lambertii Pursh.

North Dakota: Inkster (Brannon 36), Langdon, Devil's Lake, Grand Forks, Oakes, Jamestown.
South Dakota: Brookings, Sioux Falls, Iroquois, Watertown, Aberdeen, Redfield, Aurora County (Wilcox).
Dry soil on high prairies.

Desmodium canadense D. C.

North Dakota: Fort Totten (Brannon 53), Edinburg, Grafton.
South Dakota: Brookings, Sioux Falls, Iroquois.
Rich soil on the borders of woods, etc.

Vicia americana Muhl.

North Dakota: Inkster (Brannon 5), Grand Forks (Brannon 47), Manvel.
South Dakota: Brookings (Wilcox 85), Sioux Falls, Iroquois, Aurora County (Wilcox).
Moist meadows and thickets.

Vicia americana linearis Watson.

North Dakota: Manvel (Brannon 22).
South Dakota: Brookings, Iroquois, Watertown, Salem, Big Stone.
Dry fields and meadows.

Vicia villosa Roth.

South Dakota: Brookings, Mellette (Griffiths 154).
Cultivated, and rarely as an escape.

Vigna catjang Walp.

South Dakota: Brookings, Mellette (Griffiths 153).
Cultivated.

Lathyrus palustris L.

North Dakota: Merrifield (Brannon 20), Grand Forks, Inkster.
South Dakota: Brookings, Sioux Falls, Iroquois.
Moist meadows, banks, and ditches.

Lathyrus venosus Muhl.

North Dakota: Union (Brannon 44), Edinburg.
South Dakota: Brookings, Lake Hendricks.
In rich soil of meadows and thickets, climbing to a height of 4 to 8 feet, and producing a dense tangled growth.